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A. D. MELVIN, CHIEF OF BUREAU.

THE NORMAL COMPOSITION OF AMERICAN
CREAMERY BUTTER,

BY

S. C. THOMPSON, R. H. SHAW, AND R. P. NORTON,
Of the Dairy Division.



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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., March 27, 1912.

SIR: I have the honor to transmit herewith, and to recommend for publication in the bulletin series of this bureau, a manuscript entitled "The Normal Composition of American Creamery Butter," by Messrs. S. C. Thompson, R. H. Shaw, and R. P. Norton, of the Dairy Division.

The production of creamery butter has reached vast commercial proportions, and different standards are in force in the various States for the regulation of its quality and chemical composition. Much analytical work has already been published on the composition of butter, but most of it is lacking in certain essential details, with the result that little definite information regarding the normal composition of American creamery butter as now manufactured is available. A comprehensive study of the subject was undertaken by the Dairy Division, and this paper records complete analytical details of some 700 samples of creamery butter derived from 14 States. This work was done under the direction of Mr. B. H. Rawl, chief of the Dairy Division.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.



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THE NORMAL COMPOSITION OF AMERICAN CREAMERY BUTTER.

INTRODUCTION.

During recent years the composition of butter, from a quantitative point of view, has been a subject of considerable interest. Reports of thousands of analyses for water and other constituents have appeared in various publications from time to time, but data showing the composition of normal American creamery butter and the conditions under which such butter is made are not plentiful. Hence it has been deemed advisable to make a comprehensive study of the subject.

The purpose of this bulletin is to present in a variety of ways the results of the chemical analyses of American creamery butter collected, during a period of one year, from a large number of representative creameries throughout the principal dairy districts of the United States, and to include a record of the conditions under which the butter was made.

The authors acknowledge the assistance and cooperation of the dairy and food departments of the various States mentioned in this bulletin, all of which rendered valuable aid in securing samples of butter.

PREVIOUS INVESTIGATIONS.

There is no lack of published data on the composition of American creamery butter, but such data represent, very largely, analyses made on miscellaneous samples, the sources of which are more or less obscure and the churning conditions unknown. Nothing would be gained by reviewing the mass of analyses, the great majority of which concern the moisture content alone, or were made in connection with investigations on other subjects. A brief review of some of the principal investigations follow:

The most recent and perhaps the most extended work on the composition of American creamery butter was made by Lee and Barnhart, of the Illinois Experiment Station, in 1909, and published as

Bulletin 139 of that station. They analyzed butter made in several States and purchased on the open market at Chicago, Elgin, and Aurora. Their work extended over a year. The main points in their summary are here quoted:

Average composition of 574 samples of market butter collected for a period of one year, beginning March, 1907, was: Water, 13.54; fat, 83.20; salt, 2.25; and casein and ash, 0.90 per cent.

There was no difference in the composition of butter caused by the season of the year, the State where it was made, of the dealer by whom it was handled.

Average composition of 60 samples of "convention butter" was: Water, 12.54; fat, 84.65; salt, 1.77; and casein and ash, 1.02 per cent.

The Dairy Division published in 1902, as circular 39 of the Bureau of Animal Industry, United States Department of Agriculture, the average water content of 802 samples of creamery butter, from 400 different creameries located in 18 States. The average water content was 11.78 per cent.

C. W. Fryhofer, of the Dairy Division, analyzed butter purchased on the New York market during 1907. This work has hitherto been unpublished, and the results are as indicated in the following table:

Analysis of butter purchased on the New York market in 1907.

Contents.	Samples tested.	Average per cent.
Butterfat	170	82.35
Water	828	13.72
Salt	142	2.15
Curd	169	.88

The Massachusetts Experiment Station Report for 1892 gives the following average analysis of 25 samples of butter: Fat, 83.95; salt, 4.74; curd, 0.66 per cent (water not given).

Iowa Experiment Station Bulletin 80 gives the following average analysis of 224 samples of butter (State educational contest): Fat, 83.91; water, 12.87; salt and ash, 1.98; curd, 1.23 per cent.

THE EXPERIMENTAL WORK.

AREA COVERED.

The area covered in this investigation embraces 14 States, namely, California, Iowa, Kansas, Maine, Michigan, Minnesota, Montana, New York, North Dakota, Oklahoma, Pennsylvania, South Dakota, Texas, and Wisconsin. The samples were taken during a period of one year from 488 creameries, and the total number which reached the laboratory in good condition for analysis was 695.

METHOD OF SAMPLING.

The samples in all cases were collected by Federal and State officials who appreciated the necessity of proper sampling. The following instructions were given each official:

The samples may be taken with a trier or by stripping a tub and cutting a V-shaped wedge from top to bottom of tub. The sample should be large enough to about fill the can. A sharp knife is satisfactory for cutting out the butter, which may be put into the can piece by piece until the can is about full. The cover should be pressed on tight, the can placed in the mailing tube, and mailed to the Dairy Division.

Be sure to note the number on sticker pasted on the can and mark the same number on the detailed report of manufacture. These should be filled out for one day as fully as possible and returned to us. This work may have an important value on the future standard for butterfat in butter, and we request caution in every particular. If the sample of butter is not taken from the tub it may be taken from the churn after the butter is worked and ready to pack. The surface of the butter should be stroked with a ladle to remove free moisture appearing on the surface and then take about 10 samples from different parts of the churn, which put directly into the can. If the sample is to be taken from the print, cut off from one end enough to fill can.

The samples were placed in half-pound friction-top cans, which were inclosed in mailing tubes and sent to Washington. With the exception of a few, which were discarded, the samples were received in good condition.

A number of samples were taken from the creameries making and packing butter for the United States Navy. These are considered separately, since the butter was made under contract specifying the quantity of salt and water permitted.

METHOD OF ANALYSIS.

The samples were mixed by placing them, while still in the cans, either in warm water or on the steam bath and stirring until the mass was of the consistency of thick cream. In this condition—that is, when the butter is not solid and yet not liquid enough to pour—it can be thoroughly mixed. The charges, in duplicate, were taken after mixing in this manner.

The fat, water, and curd ¹ were determined according to the official method as described in Bulletin 107 (revised) of the Bureau of Chemistry, United States Department of Agriculture.

The salt was determined by the hitherto unpublished method devised by C. E. Gray, formerly chemist in the Dairy Division, the details of which are as follows:

Volumetric flasks of 250 c. c. capacity are used, which are provided with a second mark representing the volume of 250 c. c. plus the volume occupied by the fat in 5 grams of average butter at about 80° C. Five grams of the butter to be tested are weighed into a small beaker and washed with hot water into the volumetric flask. The flask and contents are then vigorously shaken and hot water added until the upper

¹ The term "curd" as used in this bulletin includes the ash and lactose.

layer is considerably above the second mark. The flask is then allowed to stand until the fat has risen into the neck and the upper layer settled to the upper mark, caused, of course, by contraction on the cooling of the liquid. At this point a 50 c. c. pipette is thrust into the flask and aliquots representing 1 gram quickly removed. The fat is prevented from entering the pipette by holding a finger over its mouth until the point is well below the fat layer. After cooling, the aliquots are titrated in the usual manner with a standard silver nitrate solution, using potassium chromate as indicator.

This method has been found to compare very favorably with the official method in accuracy and has the advantage of being much more rapid.

RESULTS OF THE ANALYSES.

A general table, which contains the original data of all the samples having practically complete churn records, is shown as Table I of the Appendix at the end of this paper. This table gives the samples by number, with the chemical composition and churning record of each. The following 30 tables have been constructed from the original data to facilitate study and show some of the comparisons that may be made.

Tables 1 to 12, inclusive, show averages of all samples in the aggregate. Tables 13 to 24, inclusive, have been compiled to show the average composition of butter from those States where the bulk of the samples originated. Tables 25 to 28, inclusive, give the chemical composition and churning record of those samples showing extremes in the various constituents. Tables 29 and 30 record the analysis of 34 samples of Navy butter.

GENERAL AVERAGES.

The first series of tables, Nos. 1 to 12, show the average composition of all the samples; the average composition by classes, seasons, and size of granules; the temperature of churning and of wash water by seasons; the test of buttermilk by seasons; the relation between the fat and moisture contents; and various phases of the churning conditions.

TABLE 1.—Average composition of all samples used in the investigation.

Number of samples. ¹	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
695.....	82.41	13.90	2.51	1.18

¹ This includes all samples which reached the laboratory in good condition. The churn records were, however, not complete in all cases. In the tables which follow some of the results were omitted for this reason.

The samples having complete churn records were divided into three classes: (1) Those having 84 per cent of fat and over, (2) those having

less than 81 per cent, and (3) those having 81 to 84 per cent of fat. The average composition of the three classes is given below:

TABLE 2.—Average composition of the butter by classes.

Class.	Number of samples.	Fat.	Water.	Salt.	Curd.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
1.....	124	84.78	12.45	1.78	0.98
2.....	130	79.77	15.32	3.52	1.37
3.....	370	82.55	13.85	2.41	1.18
Variation.....		5.01	2.87	1.74	.39

TABLE 3.—Average composition of the butter according to seasons in which samples were taken.

Season.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
January, February, March.....	82.46	13.94	2.49	1.10
April, May, June.....	82.93	13.67	2.42	1.96
July, August, September.....	82.12	14.04	2.58	1.25
October, November, December.....	82.25	13.81	2.55	1.38
Variation.....	.81	.34	.16	.42

TABLE 4.—Average composition of the butter according to size of granules when churning was completed.

Size of granules.	Number of samples.	Fat.	Water.	Salt.	Curd.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Small.....	224	82.64	13.66	2.48	1.22
Medium.....	292	82.45	13.93	2.46	1.16
Large.....	102	81.87	14.20	2.80	1.13
Variation.....		.77	.54	.34	.09

TABLE 5.—Average and range of temperature of churning according to seasons in which samples were taken.

Season.	Average.	Highest.	Lowest.
	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>
January, February, March.....	57	60	50
April, May, June.....	56	64	49
July, August, September.....	56	66	48
October, November, December.....	57	66	52

TABLE 6.—Test of buttermilk according to seasons in which samples were taken.

Season.	Average.	Highest.	Lowest.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
January, February, March.....	0.10	1.90	0.03
April, May, June.....	.19	1.90	.01
July, August, September.....	.20	1.30	.01
October, November, December.....	.13	.61	.02
Average of all samples.....	.17	.....	.....

TABLE 7.—*Temperature of wash water according to seasons in which samples were taken.*

Season.	Average.	Highest.	Lowest.
	°F.	°F.	°F.
January, February, March.....	59	68	50
April, May, June.....	56	68	46
July, August, September.....	56	72	42
October, November, December.....	58	75	49

TABLE 8.—*Relation between moisture and fat content, the variations in the fat content of samples having fixed moisture content.*

Number of samples.	Per cent of samples.	Moisture.	Fat.		
			High.	Low.	Average.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
8	1.2	10 to 10.99...	87.39	84.06	85.86
30	4.8	11 to 11.99...	86.60	82.32	85.10
92	14.7	12 to 12.99...	86.36	81.47	84.04
221	35.4	13 to 13.99...	84.86	78.98	82.91
168	26.9	14 to 14.99...	83.97	78.72	81.13
74	11.8	15 to 15.99...	83.49	77.77	80.50
31	4.9	16 and over...	81.17	73.49	78.70

TABLE 9.—*Relation between butterfat and moisture content, the variations in the moisture content of samples having fixed fat content.*

Number of samples.	Per cent of samples.	Butterfat.	Water.		
			High.	Low.	Average.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
30	4.8	Below 79....	20.65	13.92	16.33
27	4.3	79 to 79.99...	17.56	13.64	15.37
73	11.6	80 to 80.99...	16.78	13.12	14.89
110	17.6	81 to 81.99...	16.39	12.45	14.38
128	20.5	82 to 82.99...	15.20	12.30	13.90
132	21.1	83 to 83.99...	15.06	12.05	13.37
88	14.1	84 to 84.99...	13.80	10.93	12.79
24	3.8	85 to 85.99...	12.91	10.66	11.90
12	1.9	86 and above	12.02	10.13	11.13

TABLE 10.—*Churning conditions of all samples containing 84 per cent fat or more.*

Average fat content of cream churned.....per cent..	28.04	Temperature of wash water:	
Average acidity of cream churned, per cent.....	.51	Highest.....°F..	68
Churning temperatures:		Lowest.....°F..	43
Highest.....°F..	63	Average.....°F..	57
Lowest.....°F..	48	Revolutions in wash water:	
Average.....°F..	57.1	Highest.....	50
Length of time churned:		Lowest.....	2
Highest.....minutes..	120	Average.....	11.5
Lowest.....do....	10	Revolutions in wash water (rollers in gear), 11 samples:	
Average.....do....	46.1	Highest.....	25
Size of granules:		Lowest.....	2
Small.....samples..	60	Number of revolutions worked:	
Medium.....do....	50	Highest.....	120
Large.....do....	13	Lowest.....	9
Not given.....do....	1	Average.....	20.8

TABLE 11.—*Churning conditions of all samples containing less than 81 per cent fat.*

Average fat content of cream churned.....per cent..	27.8	Temperature of wash water:	
Average acidity of cream churned, per cent.....	.503	Highest.....°F..	68
Churning temperatures:		Lowest.....°F..	48
Highest.....°F..	84	Average.....°F..	57
Lowest.....°F..	48	Revolutions in wash water:	
Average.....°F..	56.6	Highest.....	82
Length of time churned:		Lowest.....	2
Highest.....minutes..	330	Average.....	19.4
Lowest.....do....	20	Revolutions in wash water (rollers in gear), 32 samples:	
Average.....do....	53.6	Highest.....	15
Size of granules:		Lowest.....	2
Small.....samples..	41	Number of revolutions worked:	
Medium.....do....	56	Highest.....	105
Large.....do....	30	Lowest.....	3
Not given.....do....	3	Average.....	21.1
	130		

(30 samples showed 16 per cent or more of water.)

TABLE 12.—*Churning averages of samples having 81 to 84 per cent of fat.*

Fat test of cream churned, per cent.....	28.01	Granules of butter—Continued.	
Acidity of cream churned, per cent.....	.535	Large.....	62
Time churned, minutes.....	45.9	Not given.....	2
Temperature at which churned, °F.....	56.8		370
Granules of butter:		Temperature of wash water...°F..	57.3
Small.....	130	Revolutions in wash water.....	14.2
Medium.....	176	Revolutions in wash water (rollers in gear, 59 samples).....	10.8
		Number of revolutions worked....	19.94

AVERAGES BY STATES.

Tables 13 to 24, next following, show the average composition of creamery butter secured in this investigation in a number of selected States, namely, Minnesota, Wisconsin, Iowa, California, Pennsylvania, North Dakota, Texas, and Michigan.

MINNESOTA.

TABLE 13.—*Results of analyses of 223 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	82.81	13.60	2.34	1.24
Highest.....	87.39	17.33	5.62	3.32
Lowest.....	77.53	10.13	.68	.12
Variations.....	9.86	7.20	4.94	3.20

NOTE.—The "highest" and "lowest" in the above table and similar tables are the highest and lowest in all the samples; that is, the highest fat percentage and the highest water percentage, for example, would not necessarily occur in the same sample.

TABLE 14.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
1	77	2	10	8	Below 1	1	0.1
6	78	11	11	80	1	4	.2
3	79	46	12	91	2	7	.4
19	80	91	13	33	3	20	.6
37	81	54	14	9	4	31	.8
43	82	11	15	2	5	116	1.0
59	83	7	16			25	1.5
39	84	1	17			12	2.0
11	85					3	2.5
4	86					4	3.0
1	87						
223	-----	223	-----	223	-----	223	-----

¹ Or more.

NOTE.—In the above table and similar tables that follow the per cent given includes all fractions up to the next per cent given. Thus, 77 per cent includes all fractions up to 77.99 per cent.

WISCONSIN.

TABLE 15.—*Results of analyses of 117 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average.....	<i>Per cent.</i> 82.48	<i>Per cent.</i> 13.77	<i>Per cent.</i> 2.61	<i>Per cent.</i> 1.14
Highest.....	86.75	18.23	5.46	2.12
Lowest.....	75.68	10.52	.95	.23
Variations.....	11.07	7.71	4.51	1.89

TABLE 16.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
1	75	3	10	2	Below 1	1	0.2
2	77	5	11	34	1	3	.4
2	78	18	12	43	2	11	.6
3	79	47	13	23	3	30	.8
16	80	26	14	10	4	53	1.0
20	81	15	15	5	5	18	1.5
26	82	2	16			1	2.0
23	83	1	18				
16	84						
5	85						
3	86						
117	-----	117	-----	117	-----	117	-----

IOWA.

TABLE 17.—Results of analyses of 131 samples from the State.

Percentage.	Fat.	Water.	Salt.	Curd.
Average.....	<i>Per cent.</i> 82.11	<i>Per cent.</i> 14.24	<i>Per cent.</i> 2.51	<i>Per cent.</i> 1.12
Highest.....	86.08	18.54	5.96	3.25
Lowest.....	75.21	10.72	.94	.20
Variations.....	10.87	7.82	5.02	3.05

TABLE 18.—Number of samples having fixed percentages of each constituent, graduated from lowest to highest.

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
1	75	1	10	2	Below 1	5	0.20
6	78	4	11	41	1	6	.40
7	79	14	12	50	2	18	.60
19	80	33	13	28	3	22	.80
21	81	49	14	8	4	56	1.00
36	82	21	15	2	5	19	1.50
20	83	6	16			4	2.00
16	84	2	17			1	3.25
4	85	1	18				
1	86						
131	.....	131	.....	131	.....	131	.....

CALIFORNIA.

TABLE 19.—Results of analyses of 95 samples from the State.

Percentage.	Fat.	Water.	Salt.	Curd.
Average.....	<i>Per cent.</i> 82.12	<i>Per cent.</i> 14.19	<i>Per cent.</i> 2.64	<i>Per cent.</i> 1.05
Highest.....	86.91	20.65	5.17	3.41
Lowest.....	73.49	10.66	.94	.33
Variations.....	13.42	9.99	4.23	3.08

TABLE 20.—Number of samples having fixed percentages of each constituent, graduated from lowest to highest.

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
1	73	1	10	2	Below 1	1	0.2
3	78	4	11	17	1	12	.4
11	79	6	12	50	2	17	.6
9	80	31	13	16	3	24	.8
22	81	28	14	7	4	30	1.0
17	82	20	15	3	5	4	1.5
19	83	3	16			3	2.0
8	84	1	18			3	2.5
3	85	1	20			1	3.0
2	86						
95	.....	95	.....	95	.....	95	.....

PENNSYLVANIA.

TABLE 21.—*Results of analyses of 37 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	82.81	13.53	2.63	1.03
Highest.....	85.64	16.88	5.21	1.72
Lowest.....	77.92	11.72	1.35	.52
Variation.....	7.72	5.16	3.86	1.20

NORTH DAKOTA.

TABLE 22.—*Results of analyses of 17 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	82.40	13.63	2.81	1.15
Highest.....	84.83	15.73	4.29	2.70
Lowest.....	80.26	10.95	1.41	.48
Variation.....	4.57	4.78	2.88	2.22

TEXAS.

TABLE 23.—*Results of analyses of 15 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	82.76	13.98	2.15	1.11
Highest.....	85.58	20.23	3.83	2.33
Lowest.....	79.95	11.04	1.03	.52
Variation.....	9.63	9.19	2.80	1.81

MICHIGAN.

TABLE 24.—*Results of analyses of 10 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	80.99	14.44	3.31	1.26
Highest.....	83.51	16.75	5.98	2.05
Lowest.....	75.93	13.09	1.46	.50
Variation.....	7.58	3.66	4.52	1.55

The results in Tables 14, 16, and 18, which concern the States of Minnesota, Wisconsin, and Iowa, are shown graphically in comparison

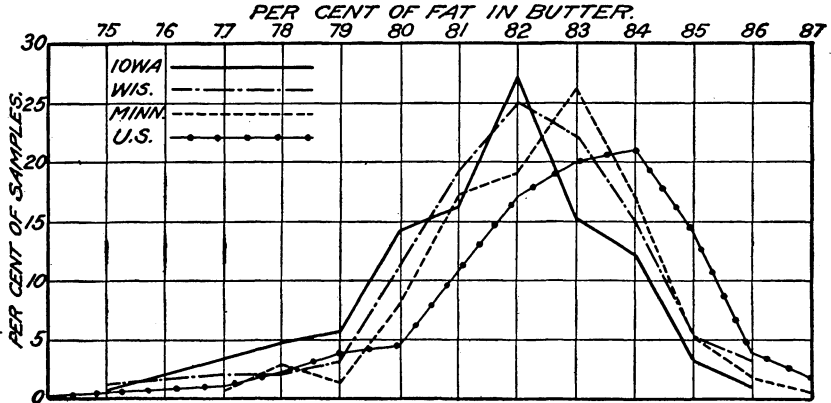


FIG. 1.—Diagram showing the fat content of the samples from Iowa, Wisconsin, and Minnesota, and of all samples in the investigation.

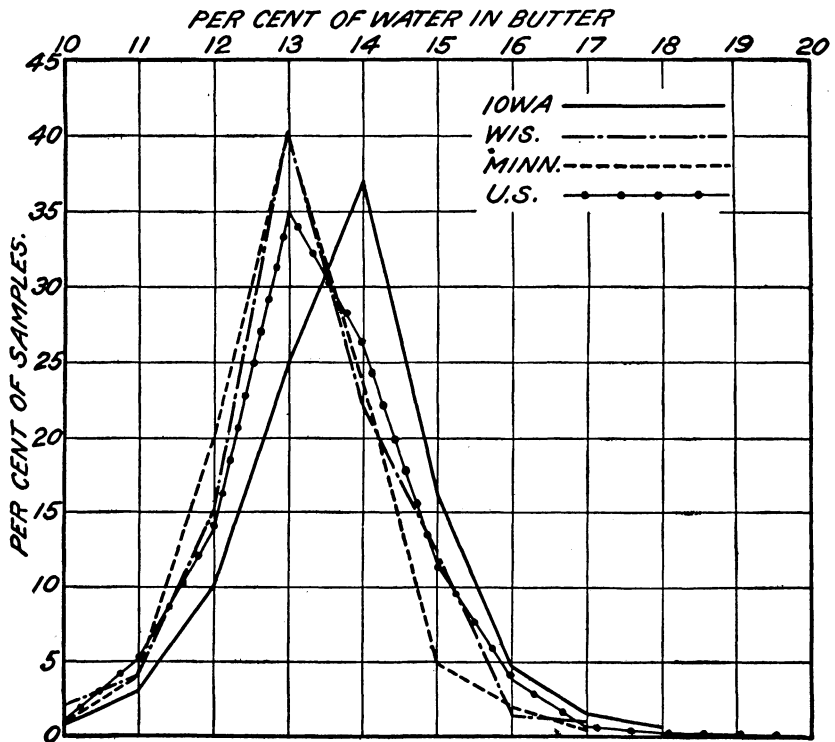


FIG. 2.—Diagram showing the moisture content of the samples from Iowa, Wisconsin, and Minnesota, and of all samples in the investigation.

tive form in figures 1 to 4. There is this difference, however, that whereas the tables give only the number of samples for each given per-

centage of the various constituents of the butter, the diagrams show percentages of both samples and constituents. In addition there is added, for further comparison, a curve representing the percentages of all the samples in this investigation.

DETAILS OF SOME EXTREME SAMPLES.

In the succeeding four tables, Nos. 25 to 28, are found details of the samples, which gave, respectively, the highest fat and lowest water record, the highest water and lowest fat record, the lowest curd record, and the highest curd record.

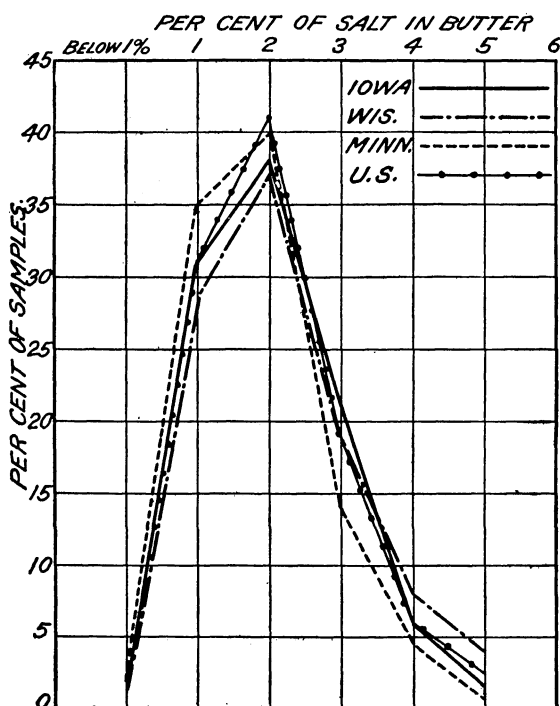


FIG. 3.—Diagram showing the salt content of the samples from Iowa, Wisconsin, and Minnesota, and of all the samples in the investigation.

TABLE 25.—Composition and churning record of sample No. 503, which has the highest fat and lowest water content found in the investigation.

Analysis: Butterfat 87.39, water 10.13, salt 1.76, curd 0.72; total, 100 per cent.

CHURNING RECORD.

Butter made.....pounds..	410	Temperature of buttermilk...°F..	58
Ripening temperature....°F..	62	Amount of wash water.....gals..	100
When cooled.....5.30 p. m.		Revolutions in wash water.....	5
Temperature when ready to churn,		Rollers in or out of gear.....	Out.
°F.....	57	Number of revolutions worked....	22
Length of time churning....min..	45	Kind of churn used.....	Victor F.
Size of granules.....	Medium fine.		

Churn cover closed tight while working the butter.

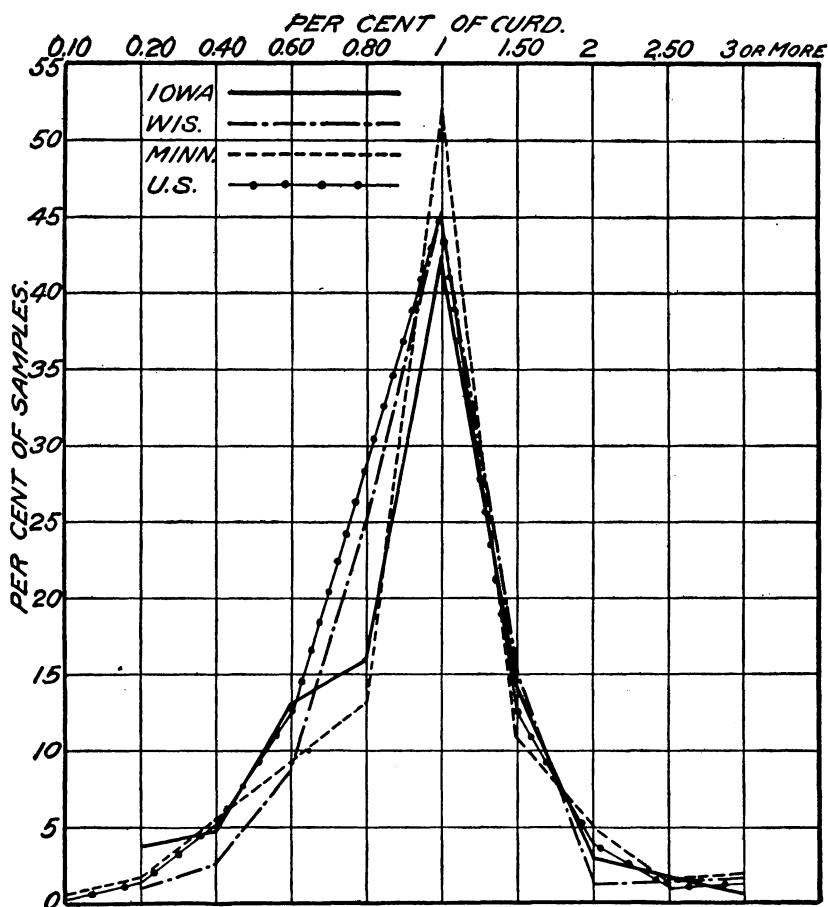


FIG. 4.—Diagram showing the percentage of curd in the samples from Iowa, Wisconsin, and Minnesota, and in all the samples in the investigation.

TABLE 26.—Composition and churning record of sample No. 784, which has the highest water and lowest fat content found in the investigation.

Analysis: Butterfat 73.49, water 20.65, salt 5.14, curd 0.72; total 100 per cent.

CHURNING RECORD.

Pounds of cream.....	1,800	Size of granules.....	Wheat.
Test of cream.....per cent..	30	Test of buttermilk.....per cent..	0.54
Pounds of butter made.....	600	Temperature of wash water...°F..	64
Pasteurizing temperature...°F..	180–185	Amount of wash water: 1st, as	
Ripening temperature.....°F..	48	much as cream; 2d, one-third as	
When cooled.....	All night.	much.	
Temperature when ready to churn,		Revolutions in wash water.....	4
°F.....	50	Rollers in or out of gear.....	In.
Kind of churn used.....	S.	Length of time worked.....min..	6
Length of time churning....min..	60		

Churn cover closed tight while working the butter.

TABLE 27.—*Composition and churning record of sample No. 417, which has the lowest curd content found in the investigation.*

Analysis: Butterfat 84.62, water 13.60, salt 1.66, curd 0.12; total 100 per cent.

CHURNING RECORD.

Pounds of cream.....	1, 313	Size of granules.....	Navy beans.
Pounds of fat in cream.....	360	Temperature of buttermilk...°F..	60
Pounds of butter made.....	430	Test of buttermilk.....per cent..	0.8
Per cent of fat in cream.....	27.4	Temperature of wash water...°F..	55
Pasteurization temperature...°F..	150	Amount of wash water: Same as	
Ripening temperature.....°F..	65	buttermilk.	
When cooled.....	2 to 6.30	Revolutions in wash water.....	12
Temperature when ready to churn,		Rollers in or out of gear.....	Out.
°F.....	59	Length of time worked.....min..	2½
Kind of churn used.....	D. No. 4.	Number of revolutions worked....	18
Length of time churning....min..	25		

Churn cover closed tight while working the butter.

TABLE 28.—*Composition and churning record of sample No. 553, which has the highest curd content found in the investigation.*

Analysis: Butterfat 81.21, water 13.85, salt 1.52, curd 3.42; total 100 per cent.

CHURNING RECORD.

Pounds of cream.....	1 11, 335	Length of time churning....min..	40
Test of cream.....per cent..	30.6	Size of granules.....	Wheat.
Pounds of fat in cream.....	1 3, 476	Temperature of buttermilk...°F..	58
Pounds of butter made.....	1 4, 349	Test of buttermilk.....per cent..	0.13
Ripening temperature.....°F..	56	Temperature of wash water...°F..	60
Acidity when ready to churn,		Amount of wash water.....gals..	100
per cent.....	0.7	Revolutions in wash water.....	10
Temperature when ready to churn,		Rollers in or out of gear.....	Out.
°F.....	57	Length of time worked....min..	5 to 10
Kind of churn used.....	D. No. 6.	Number of revolutions worked....	18

Churn cover closed tight while working the butter.

NAVY BUTTER.

Navy butter, in this article, has reference to the creamery butter made and packed for the Navy Department under the supervision of the Dairy Division, under contract to conform to specifications prepared by the division.

The specifications affecting the composition of the butter read as follows:

Butter.—Shall be fresh butter made during such period of 90 days to be stated in proposal after April 15, 1910, and before August 15, 1910, as shall be most suitable for butter making in the locality of the creamery where it is to be made, from pasteurized milk or cream, none of which shall contain before pasteurization more acid in 50 c. c. than will be neutralized by 15 c. c. or 13 c. c. of N/10 alkali solution, as determined by Mann's acid test, for butter scoring 94 and 95, respectively.

¹ One day's make, several churnings.

Quality.—Shall be strictly of the grade of creamery extras and must score not less than 94 and 95, respectively, at the time of packing.

Composition.—Moisture in the butter must not exceed 13 per cent. There must be no preservative used other than common salt, and that shall be at a rate giving not less than $2\frac{1}{2}$ per cent or more than $3\frac{1}{4}$ per cent salt in the butter at time of packing.

Inspection.—The ingredients, manufacture, sanitation, packing, boxing, marking, and shipping of the butter shall be subject to inspection by Government inspectors, who shall have full authority to reject any lot of milk, cream, or the finished butter, or any other requirement which does not conform in every respect to these specifications.

Tests.—The Government inspector shall make all the necessary tests to determine that the acid in the milk or cream and the salt and moisture contents in the butter are within the limits specified.

The samples of Navy butter analyzed in this investigation gave the following results:

TABLE 29.—Composition of 34 samples of Navy butter.

Percentage.	Fat.	Water.	Salt.	Curd.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Average.....	84.13	12.21	2.72	0.94
Highest.....	85.46	13.09	3.18	1.81
Lowest.....	82.90	11.19	2.02	.48
Variation.....	2.56	1.90	1.16	1.33

SAMPLES DIVIDED ACCORDING TO SIZE OF GRANULES AT TIME CHURNING WAS COMPLETED.

Large granules.....	84.27	12.10	2.70	0.92
Medium granules.....	83.69	12.69	2.68	.93
Small granules.....	84.31	11.93	2.78	.97

TABLE 30.—Churning conditions of samples of Navy butter.

Average fat content of cream churned.....per cent.. 31	Temperature of wash water:	
Average acidity of cream churned.....per cent.. 0.164	Highest.....°F.. 51	
Churning temperatures:	Lowest.....°F.. 42	
Highest.....°F.. 56	Average.....°F.. 46	
Lowest.....°F.. 46	Revolutions in wash water (rollers out of gear):	
Average.....°F.. 51	Highest..... 12	
Length of time churned:	Lowest..... 4	
Highest.....minutes.. 120	Average..... 9.5	
Lowest.....do.... 30	Revolutions butter was worked:	
Average.....do.... 55	Highest..... 33	
Size of granules:	Lowest..... 13	
Small.....samples.. 11	Average..... 22	
Medium.....do.... 10		
Large.....do.... 13		
34		

APPENDIX.

The detailed analyses of all the samples in this investigation are given in the two following tables. Table I records the general samples, and Table II the samples of Navy butter.

TABLE I.—Detailed analyses of samples of American creamery butter.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules. ¹	Churning temperature.		Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.							° F.	° F.		Rollers in gear.	Rollers out of gear.	
1	July.....	Per ct.	Per ct.	P. ct.	P. ct.	Lbs.	P. ct.	P. ct.	I	Mins.	S	60	60		6		32
2	do.....	79.58	15.37	3.94	1.11		31	0.64	I	100	S	60	60		6		32
3	do.....	79.23	15.70	4.36	.71		29	.66	I	95	M	60	60				12
4	do.....	79.77	15.00	3.96	1.27		25		G	60	S	58	58				12
5	do.....	80.75	13.66	4.02	1.57		25		G	45	S	59	58				12
7	do.....	79.40	14.17	5.17	1.26		25		G	35	S	60	58				12
11	August.....	81.00	14.54	3.59	.87	1,010	30	.60	I	58	S	57	66				8
12	July.....	83.25	14.31	1.31	1.13	228	33		I	45	S	50	52				15
13	June.....	82.00	14.51	2.41	1.08	658	25	.60	I	55	S	58	54				11
14	July.....	81.41	15.02	2.69	.88	504	25		I	35	M	59	48				14
15	do.....	84.38	12.93	1.88	.81	571	28		I	75	M	48	53				12
16	do.....	82.14	14.05	1.97	1.84	185	33		I	45	M	55	52				20
17	do.....	84.13	13.58	1.58	.71	580	31		I	105	M	54	56				12
18	do.....	85.98	12.31	1.05	.66	161			I	35	L	52	50				14
19	June.....	79.93	14.76	4.45	.86	732	25		I	30	S	62	58				33
20	do.....	81.91	14.95	2.28	.86	859	26		I	28	S	62	48		5		7
21	July.....	84.25	12.99	1.87	.89	530	24		I	45	M	53	52				8
22	do.....	80.38	15.85	2.85	.92	2,386			I	30	L	56	50		2		20
23	do.....	81.37	14.52	3.34	.77	1,195			O	45	L	56	60				10
24	do.....	82.86	14.50	1.77	.87	625	27		I	45	M	60	52				20
25	do.....	82.00	14.19	2.59	1.22	500			B	55	M	50	50				7
26	do.....	83.07	13.47	2.45	1.01	1,429	26		B	40	M	54	52				4
27	do.....	82.04	13.11	3.71	1.14	690	28		B	70	L	54	60				10
28	do.....	85.34	12.46	1.19	1.01	591	29		B	45	M	63	52				30
29	do.....	80.49	15.28	2.84	1.39	315			B	40	M	54	54		5		18
30	do.....	82.74	14.58	1.90	.78	580			I	60	L	52	55				11
31	November.....	80.79	14.22	3.91	1.08	607	22		B	30	M	62	58				15
33	December.....	80.01	14.90	3.52	1.57	2,294	21		E	40	S	60	60				18
35	September.....	79.10	17.56	2.17	1.17			.36	F	60	M	54	52		10		23
40	November.....	83.78	13.13	1.72	1.37	163	26		I	45	M	60	54		6		20
44	April.....	84.28	13.41	1.62	.69	896	34	.52	G	35	M	54	55				6
47	July.....	80.23	14.45	4.59	.73	732	26	.50	G	40	S	52	52				3
54	August.....	84.28	12.33	2.02	1.37	662	29	.54	B	75	L	60	58				2
55	do.....	80.31	14.36	4.40	.93	600			I	60	S	54	56				15
59	do.....	84.09	13.10	1.88	.93	629	25½	.65	B	95	L	61	58				6
60	do.....	83.49	13.22	2.05	1.24	640	27½	.59	B	52	L	60	58				33
61	July.....	80.91	14.76	3.39	.94	650	32	.50	G	40	S	51	48				7
63	August.....	81.85	13.81	3.83	.51	315			G	30	M	57	57				10
64a	do.....	84.70	12.12	1.89	1.29	336	26		B	50	S	57	58				17
72	do.....	84.09	12.51	2.77	.63	335	28		B	40	L	57	61				10
73	do.....	83.27	13.63	1.95	1.15	373	32		I	45	M	50	60				6
100a	October.....	81.98	14.65	2.79	.58	1,240	27½		G	90	S	59	61				71
101	do.....	82.45	14.07	2.77	.71	1,240	27½		I	50	S	58	58				81
105	July.....	75.68	18.23	5.46	.63	1,183			G	25	L	52	54		10		15
106	do.....	80.85	15.19	2.41	1.55	630	35		I	40	M	52	52				8
107	do.....	82.21	15.20	1.33	1.26	126	22		B	30	M	58	53				6
108	do.....	83.20	12.48	3.79	.53	910		.49	I	75	M	49	52				20
109	do.....	84.07	13.02	1.99	.92	389			I	90	M	52	52				10
110	do.....	79.37	16.65	3.04	.94	424			F	210	S	52	50				10
111	do.....	84.38	13.50	1.02	1.10				I	45	M	53	52				15
112	do.....	81.80	14.49	2.94	.77	767	31		I	60	L	58	60				30

¹ The letters in this column stand for small, medium, and large. Granules the size of a grain of wheat and less are called "small"; those as large as a pea or bean are called "medium"; and when larger than a bean they are called "large."

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		<i>Per ct.</i>	<i>Per ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>P. ct.</i>		<i>Mins.</i>		<i>° F.</i>	<i>° F.</i>			
115	August.....	84.79	12.28	2.24	0.69	182	.....	.....	B	60	M	53	54	.....	.....	22
123	November.....	82.73	13.90	2.04	1.33	1,560	.....	0.36	B	40	S	60	64	14	.....	28
124	do.....	82.27	14.30	2.82	.61	545	19	.....	I	60	S	58	59	15	.....	.....
126	do.....	81.82	14.07	2.47	1.64	840	25	.....	G	70	S	54	54	.....	12	.....
130	July.....	77.92	15.99	5.21	.88	697	22	.47	G	100	M	52	50	.....	12	21
132	do.....	78.80	16.42	3.95	.83	700	24	.47	G	100	M	50	50	.....	6	17
138	August.....	84.85	12.41	2.15	.59	410	.....	.52	D	40	S	53	62	.....	20	18
139	do.....	82.77	13.60	2.64	.99	453	.....	.....	D	35	S	53	54	.....	11	23
140	do.....	83.28	12.74	2.14	1.84	236	21½	.....	I	48	M	52	52	.....	5	11
141	do.....	80.28	13.74	5.16	.82	380	.....	.50	I	45	M	52	65	.....	25	6
142	do.....	81.77	14.00	3.24	.99	440	.....	.....	I	45	M	58	58	100	.....	15
143	July.....	84.20	13.60	1.27	.93	415	28	.....	B	30	M	61	54	.....	10	18
144	do.....	83.22	12.04	3.97	.77	251	27	.....	I	35	M	58	59	.....	20	18
145	do.....	83.54	13.35	1.91	1.20	723	28	.....	B	30	M	61	54	.....	12	19
146	August.....	81.27	13.88	2.24	2.61	453	26	.65	B	35	M	59	60	.....	12	27
147	July.....	83.68	14.04	1.79	.49	655	24	.....	B	22	S	57	52	.....	12	17
148	do.....	82.23	14.31	2.68	.78	712	30½	.37	B	40	L	56	64	.....	10	16
153	do.....	81.15	14.78	3.04	1.03	810	41½	.42	I	45	L	54	68	.....	6	14
155	do.....	82.25	14.31	2.76	.68	.....	.....	.55	I	40	L	56	64	.....	12	18
156	do.....	81.75	14.45	2.77	1.03	900	.....	.52	B	50	L	56	60	.....	12	18
157	do.....	78.80	16.83	3.09	1.28	800	.....	.43	B	50	L	56	62	.....	12	18
158	do.....	82.43	13.78	2.39	1.40	411	.....	.....	B	35	L	57	50	.....	7	19
159	do.....	82.50	14.57	2.30	.63	.....	.....	.....	I	40	M	56	54	.....	7	18
160	do.....	81.30	15.05	3.14	.51	.....	.....	.....	B	60	L	55	52	10	.....	24
161	do.....	82.09	14.80	1.53	1.58	.....	.....	.....	I	60	M	55	52	7	.....	30
162	do.....	80.01	15.11	4.21	.67	.....	.....	.68	B	45	S	54	50	.....	12	35
168	December.....	83.26	13.13	1.93	1.68	389	24	.68	I	48	M	60	60	.....	12	18
169	August.....	78.66	15.10	5.14	1.10	424	26	.....	I	45	M	56	50	3	7	12
176	do.....	81.62	14.67	2.90	.81	420	22	.....	I	35	S	55	52	.....	20	12
177	July.....	83.31	13.90	1.27	1.52	298	.....	.....	I	40	S	53	52	.....	7	.....
178	do.....	81.64	13.49	4.27	.60	360	32	.38	I	40	S	54	50	.....	6	9
179	August.....	78.82	16.63	3.48	1.07	582	.....	.....	I	60	M	58	53	.....	29	11
180	do.....	84.01	13.65	1.49	.85	780	26	.....	E	55	S	55	52	.....	5	18
185	October.....	84.83	12.65	2.16	.36	607	30	.....	D	40	M	58	57	4	.....	15
191	July.....	85.16	11.04	2.66	1.14	500	.....	.15	B	50	L	52	49	.....	10	29
192	August.....	82.27	14.09	2.83	.81	.....	33	.....	G	35	S	59	56	.....	8	13
193	do.....	83.38	13.27	2.46	.89	.....	27	.....	G	35	S	58	57	.....	4	11
194	do.....	82.21	14.05	2.81	.93	568	32½	.60	I	35	M	57	61	32	12	23
203	November.....	84.03	13.52	1.41	1.04	471	.....	.....	I	45	M	54	54	.....	20	20
205	August.....	82.29	13.69	3.10	.92	700	35	.....	B	30	L	56	52	.....	7	12
206	do.....	84.77	12.86	1.25	1.12	.....	.....	.....	I	60	M	52	52	.....	.....	.....
207	July.....	80.81	15.04	3.19	.96	1,701	.....	.....	I	50	M	53	52	.....	2	14
208	August.....	75.21	18.54	4.61	1.64	372	34	.....	I	45	S	54	50	.....	20	20
209	do.....	81.81	14.59	2.76	.84	1,008	30	.....	I	30	M	58	57	.....	6	14
210	do.....	81.70	13.66	3.21	1.43	620	25	.....	I	35	M	51	53	.....	4	8
211	do.....	82.16	15.02	1.28	1.54	693	.....	.....	I	30	M	56	53	10	.....	10
212	do.....	82.53	14.12	2.07	1.28	155	25	.....	I	45	M	51	50	.....	10	14
213	do.....	81.83	13.88	2.17	2.12	459	25	.....	S	65	S	50	52	10	.....	15
214	do.....	80.25	15.28	3.44	1.03	390	25	.....	I	40	M	52	56	.....	12	15
220	do.....	83.06	13.48	2.54	.92	.....	31	.....	I	60	L	64	55	.....	8	15
221	do.....	80.87	15.15	2.79	1.19	.....	28	.....	G	50	L	64	54	.....	44	13
222	do.....	82.74	14.05	2.54	.67	1,090	29	.....	G	60	L	63	54	.....	44	15
236	do.....	84.27	12.24	2.30	1.19	2,068	.....	16	D	50	S	54	46	.....	12	20
243	do.....	82.70	13.22	2.41	1.67	495	.....	.....	I	60	S	54	52	12	.....	11
244	do.....	82.88	14.42	1.24	1.46	568	23	.....	I	65	M	51	52	.....	10	12
247	do.....	84.56	12.98	1.35	1.11	402	25	.....	I	45	S	52	53	.....	8	14
251	do.....	80.62	15.45	3.06	.87	1,422	31	.....	G	45	M	62	53	.....	8	16
252	do.....	81.58	14.92	2.74	.76	1,422	30	.....	G	30	L	64	52	.....	59	15
253	October.....	83.76	12.70	1.53	2.01	345	27	.60	B	40	M	58	59	.....	4	24
254	do.....	81.17	16.39	1.83	.61	324	32	.55	B	30	M	59	66	15	.....	30
255	January.....	83.17	14.04	1.57	1.22	181	24	.45	B	30	M	66	68	.....	30	30
257	September.....	79.13	14.04	5.62	1.21	401	29	.....	E	25	M	58	59	.....	12	20
258	October.....	83.41	13.84	1.45	1.30	310	31	.62	I	40	M	60	58	.....	4	15
259	January.....	82.44	13.98	2.08	1.50	576	28	.45	B	30	S	61	59	.....	10	32
261	do.....	81.15	13.95	3.45	1.45	792	23	.60	B	50	L	61	62	.....	30	30
262	October.....	83.74	13.46	1.67	1.13	600	25	.58	B	40	M	57	56	.....	2	26
263	August.....	82.62	14.11	1.87	1.40	587	.....	.66	E	30	M	56	50	.....	8	30
264	do.....	82.74	13.31	2.60	1.35	844	32	.63	E	50	M	54	50	.....	8	33
265	do.....	82.58	14.07	2.31	1.04	493	33½	.64	B	40	M	58	56	.....	10	26
286	do.....	86.03	11.49	1.61	.87	326	30	.40	B	30	M	60	54	.....	16	22
269	September.....	84.34	13.80	.92	.94	531	.....	.....	I	120	S	54	62	.....	20	12
270	do.....	77.53	16.79	3.60	2.08	472	.....	.....	G	45	M	50	52	.....	5	20

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
271	September	<i>Per ct.</i>	<i>Per ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>P. ct.</i>	E	<i>Mins.</i>	<i>M</i>	<i>° F.</i>	<i>° F.</i>			
278	July	83.67	13.70	1.39	1.24	286	25		B	50	M	59	58		22	25
279	August	80.54	15.36	3.20	.90	800		0.23	B	55	L	54	58		12	18
280	do.	81.81	14.64	2.46	1.09	712		.30	B	50	L	54	60		12	18
281	do.	82.81	13.38	2.89	.92	950		.23	B	55	L	54	60		12	16
282	do.	81.99	14.70	2.86	.45	500		.29	B	35	S	52	58		12	18
283	do.	81.43	13.88	3.57	1.12	800		.25	B	40	L	54	60		12	18
285	March	83.04	13.18	2.90	.88	600			B	40	M	58	58		12	18
286	August	80.86	16.43	1.76	.95	840	31		I	60	L	53	54		12	12
287	November	82.45	13.92	2.62	1.27	772	28		I	90	M	56	56		10	30
288	August	82.21	13.99	3.06	.74	748	25		I	105	M	56	54		12	12
289	do.	83.36	13.56	2.15	.93	690			B	45	M	54	50		4	28
290	do.	80.49	14.14	3.20	2.17	630	25		I	40	M	52	52		12	9
291	do.	80.27	16.78	1.94	1.01	1,035	30		I	30	M	53	53		38	15
292	do.	81.05	15.61	2.42	.92	1,126			I	60	M	54	52		6	16
293	do.	80.86	14.73	3.62	.79	600	25		I	70	M	56	52		6	12
295	September	81.34	14.28	2.84	1.54	600	32		B	60	M	54	54	26		18
296	October	82.53	14.84	1.86	.77	600	26		B	60	M	54	50		6	24
297	do.	80.67	14.70	3.36	1.27	117			B	60	M	53	52		25	24
298	do.	82.20	13.78	3.74	.28	560			I	55	L	54	52		30	25
299	do.	81.22	15.49	2.23	1.06	393	35	.51	I	35	M	50	50		10	18
300	August	80.15	14.88	3.63	1.34	110			F	20	M	54	56	10		35
301	do.	84.76	11.97	1.75	1.52	617	25	.64	E	68	M	55	52		20	20
302	do.	82.85	14.42	1.59	1.14	1,000	40	.54	B	15	L	52	52	4		18
303	do.	82.12	14.05	1.84	1.99	625	25	.59	I	71	M	55	54		20	18
304	do.	82.48	14.00	1.85	1.67	404	30		B	35	S	48	50	15		15
305	September	83.38	13.52	1.98	1.12	194		.70	I	75	S	54	54		22	17
306	October	85.02	12.21	1.44	1.33	202			E	30	S	60	53		10	20
307	August	83.34	14.20	1.13	1.33	317			I	50	M	52	50		7	15
308	October	83.48	12.89	1.53	2.10	222			E	45	M	58	52		17	20
309	do.	81.24	14.54	2.93	1.29	450	26		I	45	M	53	54		6	12
311	August	82.96	13.29	1.44	2.31	285			F	30	S	58	56	10		
312	do.	82.30	14.20	1.85	1.65	656	25		I	55	L	55	55		6	10
313	do.	84.33	13.55	.99	1.13	470			I	60	L	56	52	8		16
314	do.	81.13	14.90	2.79	1.18	419	28		I	70	M	58	52		30	15
315	September	83.64	13.72	1.35	1.29	200	25		E	45	M	58	52		10	20
316	do.	83.96	12.70	1.60	1.74	1,000			E	60	L	51	56		10	15
317	do.	81.51	15.29	1.73	1.47	265			I	45	M	57	60	10	12	10
318	October	80.73	14.18	4.05	1.04	600	33		B	60	M	57	56		10	25
319	August	82.41	14.60	2.36	.63	449	30		B	60	L	56	54		10	25
322	September	79.71	13.74	4.11	2.44	429	30		H	60	L	57	55		12	72
323	August	80.27	15.14	2.41	2.18	705	29		G	60	L	57	52		66	13
324	do.	79.75	13.64	4.09	2.52	560	27		G	120	M	63	58		9	18
326	September	81.86	14.76	2.16	1.22		26		G	16	S	63	61		5	12
327	do.	78.98	13.92	4.14	2.96	207	24	.45	H	65	S	56	62		13	105
328	August	81.98	14.22	2.50	1.30	4,400	29		G	40	M	66	60			12
329	do.	84.93	12.65	1.90	.52		33		G	40	M	61	43		4	13
330	do.	83.00	14.48	1.19	1.33			.69	G	30	M	65	58		83	9
331	do.	81.59	14.32	2.70	1.39		32		G	40	S	60	42		4	14
332	do.	81.78	13.78	2.79	1.65		34		G	45	M	60	44		4	13
334	do.	78.72	14.60	3.27	3.41		30		G	20	S	58	45		5	16
335	do.	79.78	14.87	2.74	2.61		31	.65	G	60	L	64	59		82	15
337	do.	81.77	12.70	3.78	1.75		27		B	50	M	61	68		27	15
338	do.	82.68	13.56	2.79	.97		37		G	30	S	61	56		20	20
339	do.	83.19	12.62	3.01	1.18		32	.50	G	40	M	65	59		85	15
340	do.	86.91	11.13	.94	1.02		27		B	60	S	62	67		30	15
360	September	80.45	15.03	2.56	1.96	506	30		I	45	S	54	50	2		11
361	do.	77.64	16.61	4.47	1.28	500	32		B	50	S	56	64		2	15
364	August	80.80	14.30	3.24	1.66	950		.29	B	55	L	54	62		12	18
365	do.	78.78	16.39	4.06	.77	1,050		.28	B	70	L	54	60		12	18
369	do.	82.65	13.10	3.14	1.11	1,000		.28	B	60	L	54	58		12	18
370	September	83.08	13.09	3.20	.63	385	28		G	60	S	55	58		20	24
371	August	81.67	13.84	3.21	1.28	450		.29	B	20	L	54	58		12	18
372	do.	81.93	14.15	2.89	1.03	900		.27	B	30	S	52	58		12	18
373	October	83.51	13.83	1.46	1.20	325			B	20	S	55	58		3	14
374	do.	79.46	15.11	4.93	.50	700			I	60	S	56	60		9	12
375	do.	82.63	13.90	2.60	.87	567			B	30	S	56	56		5	22
381	September	81.84	15.25	1.82	1.09	560			E	60	M	50	56		12	18
383	do.	82.69	13.94	2.21	1.16	291			I	40	L	54	54		10	13
384	August	80.96	13.57	4.32	1.15	545			D	60	L	53	51	9		24
385	September	84.06	13.20	1.37	1.37	582	22		I	45	S	52	58		10	10
386	do.	82.35	13.89	2.61	1.15	700			I	60	M	56	52		10	14
387	do.	81.74	14.31	3.07	.88	623	23		B	75	L	58	58		12	27

TABLE I.—*Detailed analyses of samples of American creamery butter—Continued.*

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
388	August.....	82.41	13.09	3.38	1.12	632	23	.....	I	60	M	56	51	4	13	26
389	do.....	81.93	13.63	3.24	1.08	236	.....	.....	I	30	M	56	52	2	10	20
390	do.....	78.89	15.54	5.24	1.33	515	.....	.....	I	25	M	57	54	8	5	8
391	September.....	81.39	14.70	4.41	1.50	530	.....	.....	I	40	M	57	63	.....	.....	20
392	do.....	77.09	16.52	1.41	1.31	750	.....	0.56	I	30	L	56	61	5	1	15
393	do.....	85.51	12.98	2.07	1.65	407	.....	.....	I	40	M	54	52	.....	.....	15
394	do.....	83.54	12.15	1.84	1.41	498	.....	.54	D	45	M	48	54	20	1	15
395	August.....	84.37	12.95	2.07	1.41	395	.....	.42	I	40	M	50	56	10	5	15
396	do.....	83.38	13.73	2.00	1.01	395	.....	.....	G	75	M	54	54	12	12	13
397	September.....	83.38	13.73	2.00	1.23	89	.....	.....	I	20	M	54	54	12	12	13
398	August.....	82.52	13.50	2.75	1.55	620	.....	.....	I	40	L	52	52	8	19	19
399	do.....	81.89	12.45	3.71	1.91	550	.....	.....	I	30	S	56	54	4	16	16
400	do.....	80.95	13.78	3.36	1.81	467	.....	.....	I	35	S	56	58	6	10	10
401	do.....	82.55	14.12	3.36	1.91	500	.....	.....	I	35	S	56	51	18	18	18
402	do.....	81.60	14.41	2.64	1.81	445	.....	.....	I	35	S	58	58	2	25	25
403	do.....	83.80	13.18	2.64	1.81	423	.....	.....	I	35	S	58	58	20	25	25
404	do.....	83.80	13.59	.99	1.99	423	.....	.50	I	48	S	57	66	35	45	45
405	do.....	83.88	13.18	4.48	1.19	999	.....	.....	E	70	M	62	62	2	26	26
406	September.....	79.08	15.25	2.43	1.95	586	.....	.40	E	48	M	60	59	8	18	18
407	do.....	81.32	14.07	2.43	1.19	499	.....	.....	E	48	M	62	59	12	12	12
408	do.....	85.01	12.07	3.20	1.22	530	.....	.....	B	40	M	62	52	12	12	12
409	August.....	81.95	13.63	3.20	1.22	375	.....	.60	B	30	L	61	63	8	18	18
410	do.....	81.95	13.63	3.20	1.22	375	.....	.....	B	30	L	61	63	25	25	25
411	do.....	84.22	13.35	1.96	1.10	635	.....	.....	B	18	L	57	57	11	10	10
412	do.....	83.03	13.89	1.98	1.17	856	.....	.....	E	18	L	57	66	35	35	35
413	do.....	82.97	14.17	1.70	1.24	354	.....	.65	B	28	M	61	62	14	14	25
414	September.....	83.22	13.63	1.96	1.10	423	.....	.....	B	40	L	61	63	10	10	27
415	August.....	83.21	13.67	1.66	1.44	430	.....	.....	B	25	M	63	56	12	12	18
416	do.....	84.62	13.52	1.66	1.12	480	.....	.....	B	55	M	60	60	7	7	20
417	do.....	83.45	13.62	1.61	1.42	566	.....	.....	B	55	M	60	60	10	10	15
418	do.....	84.60	13.14	1.24	1.02	426	.....	.60	E	85	L	57	64	35	45	45
419	do.....	80.31	15.05	3.82	1.28	992	.....	.....	B	40	L	54	66	10	10	15
420	September.....	84.01	12.76	1.95	1.28	424	.....	.60	B	45	S	59	62	25	25	26
421	August.....	83.28	13.17	1.91	1.64	414	.....	.....	B	45	S	59	62	25	25	26
422	do.....	83.96	13.25	2.01	.78	541	.....	.....	B	43	S	59	62	25	25	26
423	September.....	83.31	12.85	2.01	1.00	414	.....	.....	B	80	S	58	57	15	15	18
424	August.....	83.41	13.46	2.61	1.19	833	.....	.....	B	23	M	58	58	2	2	32
425	do.....	83.60	13.46	2.61	1.19	572	.....	.50	B	30	S	63	65	2	2	25
426	September.....	83.45	13.62	1.92	1.01	428	.....	.....	B	30	M	63	65	2	2	25
427	August.....	86.60	11.51	1.98	1.00	418	.....	.20	B	60	S	64	65	6	6	23
428	do.....	83.23	13.65	2.46	1.00	420	.....	.....	I	60	S	63	65	2	2	23
429	do.....	83.23	13.65	2.46	1.00	420	.....	.....	B	60	S	63	65	2	2	23
430	September.....	83.43	13.19	2.46	1.00	420	.....	.....	B	60	S	63	65	2	2	23
431	do.....	81.55	13.87	2.43	1.85	531	.....	.....	B	60	M	52	53	7	7	20
432	do.....	75.37	16.75	3.03	2.05	370	.....	.....	G	60	M	52	53	10	10	18
433	do.....	82.34	13.05	3.03	1.34	292	.....	.....	B	60	M	52	53	10	10	20
434	do.....	82.34	13.05	3.03	1.34	292	.....	.....	B	60	M	52	53	10	10	20
435	August.....	81.06	14.96	1.72	2.24	618	.....	.....	B	35	M	62	60	12	12	20
436	September.....	80.96	12.04	1.89	2.14	423	.....	.....	B	31	M	59	61	10	7	20
437	do.....	83.43	13.19	2.46	1.02	420	.....	.....	I	60	M	52	53	10	10	20
438	do.....	83.43	13.19	2.46	1.02	420	.....	.....	B	60	M	52	53	10	10	20
439	do.....	81.57	13.15	1.54	1.55	415	.....	.....	B	45	M	52	58	10	10	25
440	do.....	81.57	13.15	1.54	1.55	415	.....	.....	F	50	M	57	62	5	5	24
441	October.....	83.20	11.59	2.24	3.04	403	.....	.....	F	50	M	57	62	5	5	24
442	August.....	85.36	13.80	1.54	1.46	403	.....	.....	I	35	S	55	58	10	10	15
443	October.....	81.32	13.82	3.43	1.17	870	.....	.....	I	35	S	55	58	10	10	15
444	do.....	81.32	13.82	3.43	1.17	870	.....	.....	I	35	S	55	58	10	10	15
445	do.....	80.40	14.08	4.59	1.19	818	.....	.....	I	35	S	55	58	10	10	15
446	August.....	81.37	13.99	3.42	1.24	773	.....	.59	B	60	M	54	54	15	15	25
447	do.....	83.30	13.99	1.36	1.35	345	.....	.....	B	60	M	54	54	15	15	25
448	do.....	83.30	13.99	1.36	1.35	345	.....	.....	B	60	M	54	54	15	15	25
449	September.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
450	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
451	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
452	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
453	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
454	August.....	83.18	13.67	1.43	1.48	550	.....	.68	I	40	M	57	64	20	20	20
455	do.....	83.18	13.67	1.43	1.48	550	.....	.68	I	40	M	57	64	20	20	20
456	do.....	85.02	12.07	1.55	1.06	617	.....	.....	E	55	S	55	48*	5	5	19
457	do.....	85.02	12.07	1.55	1.06	617	.....	.....	E	55	S	55	48*	5	5	19
458	do.....	84.01	13.09	1.88	1.08	651	.....	.....	F	75	M	59	62	25	25	20
459	September.....	82.02	13.16	1.87	1.38	720	.....	.....	B	40	M	57	64	15	15	25
460	do.....	82.02	13.16	1.87	1.38	720	.....	.....	B	40	M	57	64	15	15	25
461	do.....	82.02	13.16	1.87	1.38	720	.....	.....	B	40	M	57	64	15	15	25
462	do.....	82.02	13.16	1.87	1.38	720	.....	.....	B	40	M	57	64	15	15	25
463	August.....	85.36	13.80	1.54	1.46	403	.....	.....	I	35	S	55	58	10	10	15
464	October.....	81.32	13.82	3.43	1.17	870	.....	.....	I	35	S	55	58	10	10	15
465	do.....	81.32	13.82	3.43	1.17	870	.....	.....	I	35	S	55	58	10	10	15
466	do.....	80.40	14.08	4.59	1.19	818	.....	.....	I	35	S	55	58	10	10	15
467	August.....	81.37	13.99	3.42	1.24	773	.....	.59	B	60	M	54	54	15	15	25
468	do.....	83.30	13.99	1.36	1.35	345	.....	.....	B	60	M	54	54	15	15	25
469	September.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
470	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
471	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
472	do.....	82.02	14.17	2.36	1.74	583	.....	.50	B	45	M	54	58	10	10	25
473	do.....	84.01	13.09	1.88	1.08	651	.....	.....	B	75	M</					

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions out of gear.	Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.		
487	October.....	P. c. t. 83.44	P. c. t. 13.25	P. c. t. 2.21	P. c. t. 1.10	Lbs. 594	P. c. t. 24	P. c. t. .27	B	Mins. 45	M. S. 57	56	60	10	14	14	14
488	do.....	84.99	12.73	1.37	1.91	256	21	..	B	40	S	54	50	18	21	24	24
489	November.....	82.02	14.80	1.72	1.46	624	..	..	B	90	M	62	58	15	15	24	24
490	do.....	84.10	12.17	2.37	1.38	583	..	..	B	50	M	62	58	12	12	24	24
491	March.....	82.09	14.15	2.14	1.60	591	..	..	B	60	S	52	59	10	28	28	28
492	February.....	84.28	12.56	1.86	1.02	186	24	..	B	45	M	58	56	14	14	24	24
493	March.....	83.30	13.52	1.80	1.38	..	..	..	B	35	M	59	56	20	24	24	24
494	do.....	83.80	13.05	2.07	1.38	524	25	..	B	80	M	59	62	5	6	20	20
495	do.....	83.23	13.02	1.78	1.37	403	25	..	B	35	M	55	55	4	6	20	20
496	do.....	80.74	13.12	2.92	3.32	519	22	0.35	B	90	M	62	62	12	8	26	26
497	do.....	81.53	14.77	1.85	1.36	388	24	..	B	45	S	57	54	8	20	20	20
498	do.....	83.36	13.43	1.85	1.36	388	..	..	B	45	S	57	54	8	20	20	20
499	do.....	83.11	12.66	1.98	2.03	300	28	..	B	45	S	57	54	10	7	25	25
500	do.....	84.36	12.69	3.02	2.07	635	..	..	B	60	M	58	54	10	10	25	25
501	do.....	82.11	12.80	3.02	2.07	635	..	..	B	60	M	58	54	10	10	25	25
502	do.....	83.66	13.33	1.76	1.60	503	..	..	B	45	S	57	54	10	10	25	25
503	do.....	87.39	10.13	1.76	1.72	410	25	..	B	20	L	58	58	6	6	22	22
504	April.....	80.97	14.01	3.57	1.85	879	..	..	B	20	L	58	58	4	6	22	22
507	May.....	80.87	16.19	4.29	1.30	..	..	..	B	35	S	54	60	8	10	14	14
518	April.....	84.06	10.95	1.79	1.19	280	25	..	B	15	M	52	56	7	7	10	10
519	do.....	83.88	13.14	1.79	1.19	280	28	..	B	15	M	52	56	16	16	20	20
524	September.....	81.01	14.64	3.57	1.78	178	24	..	B	25	S	54	60	8	8	10	10
525	May.....	81.45	15.40	2.48	1.67	582	27	..	B	45	S	53	53	10	10	20	20
526	do.....	82.94	13.39	1.79	1.98	166	24	..	B	60	S	54	49	13	10	20	20
527	October.....	82.94	13.92	2.72	1.47	683	31	..	B	55	S	56	57	10	25	25	25
537	September.....	81.89	14.36	3.32	2.50	795	37	..	B	30	S	57	57	10	25	25	25
538	do.....	79.82	13.61	1.93	1.76	313	34	..	B	35	S	54	54	20	20	20	20
541	August.....	83.34	13.37	1.65	1.31	384	33	..	B	40	S	54	54	25	25	25	25
549	September.....	87.87	15.01	2.95	3.17	384	34	..	B	40	S	54	54	25	25	25	25
551	October.....	82.46	13.43	2.26	1.85	310	30	..	B	35	M	60	56	12	12	18	18
552	September.....	81.81	13.34	3.17	1.68	834	28	..	B	45	S	58	60	10	10	18	18
553	do.....	81.21	13.85	1.52	2.29	349	..	..	B	40	S	58	60	10	10	18	18
556	do.....	78.79	15.64	3.28	2.29	675	27	..	B	40	S	54	52	18	18	18	18
562	October.....	80.78	14.84	2.69	1.99	240	24	..	B	27	M	53	53	18	22	22	22
563	do.....	80.78	14.84	2.69	1.99	240	24	..	B	27	M	53	53	18	22	22	22
565	November.....	83.34	13.72	2.91	1.61	182	..	..	B	30	M	58	58	5	5	20	20
564	December.....	80.75	14.53	2.91	1.81	290	..	..	B	90	S	58	58	12	12	25	25
565	November.....	80.11	14.61	2.06	3.22	404	24	..	B	70	M	57	57	5	5	30	30
566	do.....	79.74	14.67	2.34	3.25	630	30	..	B	45	S	62	59	20	20	19	19
567	December.....	84.25	12.37	1.71	1.67	645	30	..	B	45	S	62	59	6	6	20	20
568	do.....	82.33	13.92	2.52	1.65	545	25	..	B	35	S	58	57	5	5	25	25
569	do.....	78.43	16.34	3.58	1.23	570	..	..	B	60	M	56	56	10	10	22	22
571	do.....	81.25	14.71	2.24	1.13	610	..	..	B	105	S	58	57	10	10	22	22
572	September.....	78.74	15.46	4.04	1.70	750	29	..	B	25	S	56	56	20	25	25	25
573	do.....	79.66	17.49	1.15	1.70	692	..	..	B	60	M	52	58	10	13	13	13
574	do.....	84.01	11.18	3.80	1.01	390	..	..	B	40	M	58	54	32	24	24	24
575	do.....	82.42	13.92	2.57	1.09	570	28	..	B	30	S	58	54	25	25	20	20
576	do.....	82.20	14.26	1.23	2.31	260	..	..	B	45	S	56	56	15	15	16	16
580	do.....	82.79	13.60	2.27	1.34	700	25	..	B	75	M	56	56	10	10	20	20
581	do.....	82.99	13.23	2.66	1.12	540	..	..	B	45	S	56	56	3	7	27	27
583	do.....	80.96	13.88	3.74	1.42	948	..	..	B	45	S	56	56	2	2	27	27
585	October.....	80.90	14.59	2.98	1.53	640	28	..	B	35	L	58	56	5	2	25	25
587	September.....	80.29	14.45	3.27	1.99	614	..	..	B	50	L	58	56	12	12	18	18
589	do.....	81.24	14.21	3.29	1.26	..	..	..	B	70	M	56	56	8	8	19	19
590	do.....	81.34	13.82	3.81	1.03	..	..	..	B	50	L	56	56	12	12	18	18
591	do.....	81.79	12.58	3.31	1.08	445	27	..	B	17	L	56	56	7	7	20	20
592	November.....	84.74	12.58	1.77	1.91	654	26	..	B	70	S	59	60	12	14	14	14
593	September.....	83.65	13.61	1.18	1.56	118	35	..	B	35	S	61	61	18	18	16	16
594	October.....	84.71	13.78	1.82	1.69	62	34	..	B	45	S	62	62	12	12	13	13
595	April.....	85.92	11.45	2.40	1.23	945	25	..	B	35	L	61	61	12	12	16	16
615	do.....	85.43	12.02	2.40	1.86	630	20	..	B	45	S	62	62	10	10	20	20
616	do.....	85.43	12.02	2.40	1.86	630	20	..	B	45	S	62	62	10	10	20	20
618	do.....	85.75	11.90	2.84	1.00	450	..	..	B	45	S	62	62	10	10	20	20
619	do.....	85.75	11.90	2.84	1.00	450	..	..	B	45	S	62	62	10	10	20	20
620	do.....	85.21	11.65	2.85	1.85	548	..	..	B	35	S	59	59	8	8	28	28
621	do.....	84.22	13.22	1.83	1.73	352	..	..	B	35	S	59	59	8	8	28	28
622	November.....	82.75	12.44	1.41	1.40	108	29	..	B	40	M	58	60	20	25	25	25
623	May.....	83.88	12.72	3.10	1.30	608	43	..	B	40	M	58	60	20	25	25	25
624	April.....	83.85	13.81	2.47	1.87	449	..	..	B	45	S	57	57	12	12	22	22
625	do.....	84.11	13.67	1.04	1.18	599	25	..	B	40	M	58	60	8	3	26	26
626	do.....	86.32	10.76	2.22	1.70	409	..	..	B	45	S	57	57	12	12	18	18
628	October.....	85.58	11.04	2.37	1.01	115	..	..	B	35	S	58	58	6	6	14	14

1 One day's make, several churnings.

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	Per ct.	P. ct.	P. ct.	Lbs.	P. ct.	P. ct.		Mins.	S	° F.	° F.			
630	October.	84.30	12.34	1.03	2.33	465	28½		I	50	50	61	65			16
631	April.	83.34	13.90	2.24	.52	133	24		I	25	50	62	60			16
632	October.	82.79	14.61	1.65	1.05	330			I	45	50	58	75			14
633	February.	80.76	14.38	3.66	1.20	800	28		B	45	58	58	64			20
634	December.	81.48	14.71	2.55	1.26	840	36		G	45	53	53	53			20
635	January.	81.82	14.22	2.90	1.06		29		G	90	M	57	58	10	8	8
637	do.	79.55	15.72	2.73	2.00	1,050	29		G	35		53	58	8		14
639	December.	81.66	14.52	2.45	1.37	791	32		G	40	M	52	52			15
640	January.	81.39	15.02	2.30	1.29	860			H			58	61			16
643	April.	84.16	11.55	2.30	1.99	340			E	30	S	60	60			40
644	do.	82.99	12.96	2.18	1.87	1,030			B	60	S	57	56			30
645	December.	83.89	12.60	2.02	1.49	312	24		B	30	M	60	60			35
646	do.	82.88	13.33	2.59	1.20	553	23		B	45	M	61	60			35
647	do.	81.88	13.79	2.27	2.06	645	25		B	47	S	61	59			45
648	April.	83.98	12.28	3.13	.61	650			I	60	S	60	62			12
649	October.	80.97	14.37	3.02	1.64	550			I	60	M	56	56			14
650	do.	81.26	13.46	4.04	1.24	786			I	60	S	56	58			17
651	do.	81.02	14.72	3.25	1.01	746			I	60	M	50	55			16
652	do.	83.23	13.68	2.01	1.08	533			I	60	L	52	56			18
653	do.	83.74	13.49	1.51	1.26	214			I	40	M	54	56			14
654	do.	84.04	12.60	2.07	1.29	520	27		I	60	M	58	55			18
656	September	82.96	13.72	1.72	1.60				I	45	S	56	56			4
657	do.	82.80	14.27	1.72	1.21	530			I	42	S	54	55	2	8	12
658	do.	84.09	13.59	1.06	1.26	478	26½		D	60	M	56	56			14
659	October.	82.60	13.59	2.08	1.73	587	22		I	40	S	55	53	6		10
660	do.	80.70	13.78	4.20	2.32	567			I	40	M	53	56			15
662	September	82.57	13.73	2.63	1.07	203	28	0.60	I	28	S	56	55			16
667	April.	82.92	12.91	3.50	.67	275			I	30	M	62	64			12
668	do.	84.72	11.87	2.13	1.28				I	20	M	61	65			14
669	March.	80.35	15.19	3.68	.78	497	30		E	30	M	54	56	10	5	26
670	April.	83.79	13.05	2.50	.66	375	32		I	25	M	58	60			15
671	May.	85.31	11.90	1.72	1.07	140			G	55	S	51	60			25
673	do.	81.84	14.62	2.60	.94			.80	I	30	S	58	50			5
674	January.	83.62	13.85	1.42	1.11	315	30		I	20	S	64	66			4
675	May.	77.95	17.28	3.83	.94	493	32	.56	I	30	M	62	56			14
678	April.	84.36	13.16	1.63	.85	700			B	60	S	56	56			30
679	do.	81.68	14.46	2.56	1.30	598			E	60	S	54	56			22
680	November	81.58	14.11	2.96	1.35	673	25½		B	40	M	58	60			14
681	April.	84.13	12.44	2.76	.67	232		.54	B	30	S	50	56	21		32
682	do.	85.49	12.20	1.37	.94	471			B	30	M	58	60	10		30
683	do.	85.03	12.91	1.77	.29	670			B	40		60	58			24
684	December.	81.88	13.24	2.81	1.57	718	24		B	120	M	61	60			42
685	April.	83.45	13.54	1.85	1.16	945	25		B	45	S	62	52			9
686	October.	82.49	13.20	3.07	1.24	372	26	.65	B	40	S	58	60			25
687	do.	82.75	13.75	2.50	1.00	550	33	.55	I	50	M	55	57			15
688	do.	78.22	16.97	3.33	1.48	261	25	.65	B	40	M	58	62			15
689	do.	81.92	13.64	3.27	1.17	846	29	.58	I	45	L	56	54			18
690	do.	83.27	11.63	3.93	1.17	160	22	.70	I	35	M	56	60			15
691	do.	85.05	12.87	1.30	.78	106	28	.60	I	20	S	58	60			12
692	do.	81.17	13.32	4.30	1.21	770	33		B	40	M	57	60			18
693	do.	82.51	14.35	1.48	1.66	740	30	.60	I	60	M	58	54			14
694	do.	81.83	14.89	2.12	1.16	392	33	.75	I	30	S	57	68			18
695	do.	84.69	12.42	1.76	1.13	315	26	.55	B	40	M	59	58			20
696	March.	78.40	15.80	4.62	1.18	318			E	40	S	56	53			44
697	February.	83.87	12.80	2.38	.95	775			B	35	L	62	61			26
698	do.	81.27	15.26	2.42	1.05	600			B	60	M	60	64			25
700	do.	81.28	15.56	2.48	.68	740			I	60	L	61	58			14
701	January.	79.27	16.17	3.41	1.15	725	31		I	90	L	59	60	12		25
702	do.	82.44	13.64	2.94	.98	177	26½	.59	I	40	L	58	60			20
704	do.	83.96	12.45	2.83	.76	319	28	.51	G	45	M	56	56			30
705	February.	84.50	11.84	2.60	1.00	400			B	45	M	58	58			15
706	November	81.21	13.18	4.71	.90	308	30		I	60	M	58	60			18
707	April.	81.11	14.75	2.21	1.93	386	30	.50	B	30	S	58	59			28
708	November	79.45	15.55	3.46	1.54	680	20		I	120	M	52	57			11
710	do.	82.74	13.10	2.89	1.27	670	22		E		M	56	58			14
711	do.	80.61	15.10	3.38	.91	400				50	M	56	60			8
712	do.	84.79	10.93	2.38	.90	314				105	L	56	54			10
713	do.	84.64	12.80	1.41	1.15	750			G	30	M	62	63			6
716	do.	82.80	11.90	4.12	1.18	428	32	.49	A	60	S	60	52			
717	December.	80.48	15.92	1.70	1.90	183	17		G	35	M	62	60			12
723	January.	82.18	14.57	1.89	1.36	648	27	.52	B	40	S	62	68			29
724	do.	83.03	13.07	2.45	1.45	395	28	.52	B	35	L	64	64			24

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.								Rollers in gear.	Rollers out of gear.	
725	November	Per ct. 81.47	Per ct. 12.94	P. ct. 4.57	F. ct. 1.02	Lbs. 669	P. ct. 30	P. ct. .50	E	Mins. 80	M 66	° F. 62	9	6	26
726	do.	83.08	12.72	1.98	1.02	327	35	.50	B	35	M 56	68	6	6	19
727	do.	83.16	13.09	1.89	1.86	324	37	.57	B	85	S 58	66	15	6	26
728	January	83.80	12.15	2.95	1.10	468	30	.55	B	85	S 58	66	12	6	18
729	do.	82.70	13.08	2.17	2.05	280	30	.50	B	60	S 56	66	8	8	15
730	November	86.36	12.02	1.68	1.77	218	28	.58	B	60	S 56	66	12	12	18
731	do.	84.73	12.48	1.77	1.09	127	31	.65	B	65	S 59	62	6	6	16
732	do.	83.31	13.44	1.70	1.48	432	27	.51	B	64	S 57	68	25	25	30
733	do.	80.76	15.32	2.46	1.33	180	27	.61	C	75	M 57	68	25	18	18
734	do.	83.31	12.98	2.07	1.44	782	30	.....	I	64	S 57	68	10	10	15
735	do.	84.12	13.43	2.03	1.12	284	30	.....	I	48	M 55	67	4	8	18
736	January	83.30	13.48	2.03	1.29	522	23	.57	B	45	M 55	67	10	15	15
737	December	82.91	13.23	2.82	1.04	975	28	.52	B	35	L 61	61	15	8	32
738	November	81.45	15.14	2.22	1.19	133	28	.55	C	35	S 58	62	10	15	25
739	do.	82.35	13.93	2.33	1.39	160	24	.21	C	25	S 58	60	10	10	18
740	December	82.39	13.80	2.80	1.02	149	29	.53	C	40	L 60	60	15	15	25
741	November	82.39	14.77	5.65	.94	145	22	.56	C	30	S 58	60	10	10	23
742	do.	78.77	14.77	5.65	.81	206	22	.25	E	70	S 56	63	15	15	25
743	do.	80.16	15.76	2.29	1.79	198	22	.62	E	30	S 60	65	25	25	17
744	January	84.42	12.18	2.43	.97	330	27	.50	E	30	S 58	63	24	24	24
745	December	81.67	13.99	3.36	.98	220	28	.59	E	38	S 58	63	24	24	24
746	do.	83.83	12.63	2.62	.92	685	25	.....	B	55	S 58	66	12	12	24
747	do.	82.47	13.68	2.09	1.78	256	27	.43	I	37	S 56	63	24	24	31
748	do.	81.18	13.66	3.66	1.48	249	27	.50	I	47	S 56	63	30	30	35
749	do.	80.07	13.93	2.30	2.70	220	28	.....	I	40	L 58	63	10	10	18
750	do.	80.72	15.70	1.95	1.63	429	28	.50	I	120	M 59	59	8	8	14
751	do.	80.24	15.16	3.81	.79	750	.....	.58	I	60	M 55	58	15	15	18
752	do.	77.77	15.52	5.25	1.46	785	.....	.....	I	60	M 60	59	8	8	14
753	do.	82.79	13.27	2.25	1.69	620	.....	.....	B	45	S 54	65	12	12	13
754	do.	82.17	14.38	2.19	1.26	720	.....	.....	I	45	S 54	60	11	11	12
755	do.	83.47	12.51	2.60	1.42	386	26	.....	I	25	M 56	66	14	14	14
756	do.	82.54	14.00	2.29	1.17	680	.....	.....	I	24	M 60	62	9	9	14
757	do.	80.49	14.59	3.08	1.84	490	.....	.....	I	25	M 56	66	14	14	14
758	do.	80.20	15.49	2.94	1.37	275	.....	.....	I	40	M 60	58	5	5	18
759	do.	80.72	14.07	3.96	1.31	835	.....	.....	I	60	M 60	58	10	10	18
760	do.	82.32	11.56	4.70	1.36	246	.....	.....	I	40	M 60	58	10	10	18
761	do.	82.82	11.56	4.70	1.36	246	.....	.....	I	40	M 60	58	10	10	18
762	February	82.53	13.37	1.47	1.18	310	.....	.....	I	25	S 55	61	10	10	27
763	January	84.11	13.37	1.47	1.05	209	.....	.....	B	45	S 56	66	10	10	18
764	February	80.02	13.15	4.36	1.16	454	.....	.....	I	30	S 58	62	10	10	18
765	March	84.11	12.28	2.97	.88	541	.....	.....	B	35	S 58	60	12	12	28
766	February	84.83	12.72	1.57	1.21	567	.....	.....	B	29	S 58	60	6	6	16
767	May	84.83	12.72	1.57	1.21	567	.....	.....	B	29	S 58	60	6	6	16
768	February	80.94	14.81	3.25	1.00	438	.....	.....	D	40	S 60	62	14	14	25
769	March	84.60	12.94	1.45	1.21	791	.....	.....	B	40	S 55	60	12	12	25
770	February	84.13	16.23	2.15	1.21	407	.....	.....	E	40	S 60	59	10	10	18
771	do.	84.13	13.07	2.16	.64	220	.....	.....	B	27	S 55	60	10	10	18
772	March	84.86	14.25	2.01	.57	336	.....	.....	I	90	S 60	59	4	4	12
773	do.	84.86	13.22	1.35	.64	220	.....	.....	I	30	S 56	57	20	20	16
774	do.	81.83	13.35	2.15	1.50	2,031	.....	.....	I	30	S 56	57	20	20	16
775	do.	83.89	13.36	2.15	1.50	860	.....	.....	I	30	S 56	57	20	20	16
776	do.	83.89	13.36	2.15	1.50	860	.....	.....	I	30	S 56	57	20	20	16
777	do.	83.47	13.84	2.04	.65	618	.....	.....	I	25	L 62	58	6	6	10
778	do.	81.95	15.54	1.73	.78	217	.....	.....	I	40	L 62	58	6	6	10
779	do.	81.95	15.54	1.73	.78	217	.....	.....	I	40	L 62	58	6	6	10
780	do.	81.95	14.30	2.80	.95	700	.....	.....	I	25	L 62	58	6	6	10
781	do.	82.45	14.05	2.15	1.35	750	.....	.....	I	75	M 57	53	4	4	10
782	do.	83.29	14.05	1.67	.72	600	.....	.....	I	60	S 58	58	14	14	16
783	do.	73.49	20.65	5.14	1.50	600	.....	.....	G	60	S 58	58	14	14	16
784	do.	83.89	15.41	1.67	.72	600	.....	.....	G	60	S 58	58	14	14	16
785	May	81.80	15.41	1.65	1.14	500	.....	.....	G	60	S 58	58	14	14	16
786	March	85.72	11.10	2.22	.69	750	.....	.....	G	60	S 58	58	14	14	16
787	do.	82.21	15.08	1.65	.49	850	.....	.....	G	40	S 58	58	16	16	25
788	do.	82.21	15.08	1.65	.49	850	.....	.....	G	40	S 58	58	16	16	25
789	do.	79.68	16.38	3.03	.91	2,000	.....	.....	G	45	S 58	57	8	8	15
790	do.	79.68	16.38	3.03	.91	2,000	.....	.....	G	45	S 58	57	8	8	15
791	do.	81.12	15.55	1.34	.67	323	.....	.....	I	30	L 62	58	35	35	20
792	March	83.97	13.34	1.53	.42	1,037	.....	.....	I	30	L 62	58	35	35	20
793	April	84.51	13.22	2.75	.62	1,037	.....	.....	I	30	L 62	58	35	35	20
794	March	82.08	14.20	2.75	.62	1,037	.....	.....	I	30	L 62	58	35	35	20
795	do.	80.98	15.22	2.81	.45	650	.....	.....	I	75	S 55	50	12	12	24
796	do.	83.13	13.83	1.22	1.14	380	.....	.....	G	30	S 58	64	12	12	24
797	June	83.13	13.83	1.22	1.14	380	.....	.....	G	30	S 58	64	12	12	24
798	April	84.28	13.71	1.22	1.31	274	.....	.....	B	30	S 58	64	12	12	24
799	May	81.45	15.11	1.86	1.34	1,610	.....	.....	B	35	S 58	64	12	12	24
800	May	81.45	15.11	1.86	1.34	1,610	.....	.....	B	35	S 58	64	12	12	24
801	April	84.08	12.72	2.62	.97	321	.....	.....	B	25	S 58	60	25	25	25
802	May	83.69	12.72	2.62	.97	321	.....	.....	B	25	S 58	60	25	25	25
803	April	83.24	13.52	2.21	1.03	545	.....	.....	B	28	S 56	60	25	25	24

TABLE I.—Detailed analyses of samples of American creamery butter—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Rollers in wash.		Revolutions in wash.	Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.		
804 May	Per. 83.69 P.ct. 12.69 P. 2.28 P. 1.34	Per. 85.62 P.ct. 11.82 P. 2.46 P. 1.10	P. 2.28 P. 1.34	Lbs. 648	P. 25 P. 0.60	I	45	S	56	56	20	10	12	12	12	12	
805 Aprl.	85.62 11.82 2.91 1.39	81.31 13.74 1.99 1.10	82.82 14.44 1.52 1.22	668	27 27 27 27	I	30	M	58	56	50	15	16	16	16	16	
806 May	84.33 13.74 1.99 1.04	84.33 13.74 1.99 1.04	84.33 13.74 1.99 1.04	307	27 27 27 27	I	30	M	58	56	50	15	16	16	16	16	
807 Aprl.	82.82 14.44 1.52 1.22	82.82 14.44 1.52 1.22	82.82 14.44 1.52 1.22	336	28 28 28 28	I	30	M	58	56	50	15	16	16	16	16	
808 May	82.58 13.52 3.09 1.81	82.58 13.52 3.09 1.81	82.58 13.52 3.09 1.81	658	26 26 26 26	I	30	M	58	56	50	15	16	16	16	16	
809 Aprl.	81.75 14.07 3.05 1.83	81.75 14.07 3.05 1.83	81.75 14.07 3.05 1.83	789	26 26 26 26	I	60	S	55	55	60	10	10	10	10	10	
810 do.	85.40 10.72 3.06 1.09	85.40 10.72 3.06 1.09	85.40 10.72 3.06 1.09	380	25 25 25 25	I	50	S	56	56	60	10	10	10	10	10	
811 do.	83.47 14.16 2.26 1.32	83.47 14.16 2.26 1.32	83.47 14.16 2.26 1.32	374	24 24 24 24	I	95	S	58	58	60	10	10	10	10	10	
812 do.	80.06 16.57 3.26 1.11	80.06 16.57 3.26 1.11	80.06 16.57 3.26 1.11	550	22 22 22 22	I	30	S	56	56	49	8	6	2	2	2	
813 May	81.52 14.97 2.44 1.07	81.52 14.97 2.44 1.07	81.52 14.97 2.44 1.07	475	22 22 22 22	I	35	S	54	54	50	12	12	12	12	12	
814 do.	84.08 13.19 1.65 1.08	84.08 13.19 1.65 1.08	84.08 13.19 1.65 1.08	800	22 22 22 22	I	25	S	54	54	54	16	16	16	16	16	
815 do.	81.13 14.91 2.80 1.16	81.13 14.91 2.80 1.16	81.13 14.91 2.80 1.16	431	30 30 30 30	I	45	M	52	52	52	7	7	7	7	7	
816 June	82.81 14.16 1.64 1.39	82.81 14.16 1.64 1.39	82.81 14.16 1.64 1.39	700	20 20 20 20	I	25	M	58	58	58	18	18	18	18	18	
817 May	84.83 13.51 1.13 1.53	84.83 13.51 1.13 1.53	84.83 13.51 1.13 1.53	383	25 25 25 25	I	45	M	51	51	54	14	14	14	14	14	
818 Aprl.	80.81 15.88 3.93 1.41	80.81 15.88 3.93 1.41	80.81 15.88 3.93 1.41	450	25 25 25 25	I	45	M	54	54	54	4	4	4	4	4	
819 June	81.50 15.88 2.05 1.57	81.50 15.88 2.05 1.57	81.50 15.88 2.05 1.57	591	32 32 32 32	I	45	M	51	51	54	14	14	14	14	14	
820 May	83.09 13.49 2.71 1.13	83.09 13.49 2.71 1.13	83.09 13.49 2.71 1.13	500	32 32 32 32	I	35	S	52	52	52	13	13	13	13	13	
821 do.	80.69 16.14 2.04 1.13	80.69 16.14 2.04 1.13	80.69 16.14 2.04 1.13	870	32 32 32 32	I	35	S	52	52	52	13	13	13	13	13	
822 June	80.84 15.24 2.71 1.21	80.84 15.24 2.71 1.21	80.84 15.24 2.71 1.21	750	32 32 32 32	I	40	L	52	52	54	12	12	12	12	12	
823 do.	82.36 14.18 2.35 1.11	82.36 14.18 2.35 1.11	82.36 14.18 2.35 1.11	441	32 32 32 32	I	45	L	52	52	54	12	12	12	12	12	
824 do.	78.14 15.12 5.96 1.78	78.14 15.12 5.96 1.78	78.14 15.12 5.96 1.78	1,075	30 30 30 30	I	40	L	52	52	54	12	12	12	12	12	
825 May	82.30 14.25 2.08 1.37	82.30 14.25 2.08 1.37	82.30 14.25 2.08 1.37	504	29 29 29 29	I	35	M	52	52	52	11	11	11	11	11	
826 June	80.80 14.37 3.94 1.80	80.80 14.37 3.94 1.80	80.80 14.37 3.94 1.80	618	24 24 24 24	I	60	M	52	52	52	14	14	14	14	14	
827 May	82.15 14.78 2.26 1.32	82.15 14.78 2.26 1.32	82.15 14.78 2.26 1.32	693	32 32 32 32	I	50	M	52	52	52	29	29	29	29	29	
828 Aprl.	82.48 13.94 2.26 1.32	82.48 13.94 2.26 1.32	82.48 13.94 2.26 1.32	350	32 32 32 32	I	50	M	52	52	52	9	9	9	9	9	
829 do.	83.57 15.06 1.67 1.05	83.57 15.06 1.67 1.05	83.57 15.06 1.67 1.05	840	22 22 22 22	I	40	M	52	52	52	7	7	7	7	7	
830 May	86.06 11.47 1.55 1.11	86.06 11.47 1.55 1.11	86.06 11.47 1.55 1.11	1,488	22 22 22 22	I	40	M	52	52	52	9	9	9	9	9	
831 do.	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	373	24 24 24 24	I	45	M	52	52	52	12	12	12	12	12	
832 do.	86.78 13.09 2.34 1.71	86.78 13.09 2.34 1.71	86.78 13.09 2.34 1.71	475	24 24 24 24	I	35	S	54	54	54	7	7	7	7	7	
833 March	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	242	26 26 26 26	I	75	M	52	52	52	19	19	19	19	19	
834 do.	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	567	30 30 30 30	I	30	M	54	54	54	15	15	15	15	15	
835 do.	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	471	28 28 28 28	I	30	M	54	54	54	15	15	15	15	15	
836 Aprl.	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	640	25 25 25 25	I	50	M	52	52	54	10	10	10	10	10	
837 do.	78.80 15.48 4.02 1.26	78.80 15.48 4.02 1.26	78.80 15.48 4.02 1.26	525	32 32 32 32	I	50	M	52	52	54	10	10	10	10	10	
838 do.	84.77 12.65 3.49 1.08	84.77 12.65 3.49 1.08	84.77 12.65 3.49 1.08	699	31 31 31 31	I	40	M	52	52	54	10	10	10	10	10	
839 do.	81.27 14.66 1.08 1.05	81.27 14.66 1.08 1.05	81.27 14.66 1.08 1.05	562	27 27 27 27	I	40	M	52	52	54	10	10	10	10	10	
840 Aprl.	82.42 14.31 2.25 1.02	82.42 14.31 2.25 1.02	82.42 14.31 2.25 1.02	793	27 27 27 27	I	40	L	52	52	54	10	10	10	10	10	
841 do.	86.06 11.47 1.55 1.05	86.06 11.47 1.55 1.05	86.06 11.47 1.55 1.05	373	24 24 24 24	I	45	M	52	52	54	12	12	12	12	12	
842 do.	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	308	24 24 24 24	I	35	S	54	54	54	12	12	12	12	12	
843 do.	86.78 13.09 2.34 1.78	86.78 13.09 2.34 1.78	86.78 13.09 2.34 1.78	475	24 24 24 24	I	35	S	54	54	54	7	7	7	7	7	
844 March	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	242	26 26 26 26	I	75	M	52	52	54	10	10	10	10	10	
845 do.	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	567	30 30 30 30	I	30	M	54	54	54	15	15	15	15	15	
846 May	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	471	28 28 28 28	I	30	M	54	54	54	15	15	15	15	15	
847 do.	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	640	25 25 25 25	I	50	M	52	52	54	10	10	10	10	10	
848 do.	78.80 15.48 4.02 1.26	78.80 15.48 4.02 1.26	78.80 15.48 4.02 1.26	525	32 32 32 32	I	50	M	52	52	54	10	10	10	10	10	
849 Aprl.	84.77 12.65 3.49 1.08	84.77 12.65 3.49 1.08	84.77 12.65 3.49 1.08	699	31 31 31 31	I	40	M	52	52	54	10	10	10	10	10	
850 do.	81.27 14.66 1.08 1.05	81.27 14.66 1.08 1.05	81.27 14.66 1.08 1.05	562	27 27 27 27	I	40	M	52	52	54	10	10	10	10	10	
851 May	82.42 14.31 2.25 1.07	82.42 14.31 2.25 1.07	82.42 14.31 2.25 1.07	793	27 27 27 27	I	40	M	52	52	54	10	10	10	10	10	
852 do.	86.06 11.47 1.55 1.05	86.06 11.47 1.55 1.05	86.06 11.47 1.55 1.05	373	24 24 24 24	I	45	M	52	52	54	12	12	12	12	12	
853 do.	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	84.37 14.10 1.45 1.05	308	24 24 24 24	I	35	S	54	54	54	12	12	12	12	12	
854 March	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	82.52 13.50 3.23 1.20	242	26 26 26 26	I	75	M	52	52	54	10	10	10	10	10	
855 do.	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	81.08 14.26 2.19 1.37	567	30 30 30 30	I	30	M	54	54	54	15	15	15	15	15	
856 Aprl.	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	82.16 15.48 1.47 1.26	471	28 28 28 28	I	30	M	54	54	54	15	15	15	15	15	
857 do.	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	79.24 15.68 4.13 1.41	640	25 25 25 25	I	50	M	52	52	54	10</					

TABLE I.—*Detailed analyses of samples of American creamery butter—Continued.*

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
1073	April.....	Per ct. 84.19	Per ct. 13.42	P. ct. 1.37	P. ct. 1.02	Lbs. 699	P. ct. 38	P. ct. 0.57	G	Mins. 30	S 8	° F. 57	53	5	6	15
1077	do.....	83.26	13.46	1.73	1.45	694	38	.54	B	55	S 8	54	53	8	8	16
1078	do.....	79.88	14.73	4.74	.83	322			B	60	S 8	56	58	6	6	28
1080	do.....	84.06	13.34	1.72	.65	586			I	32	S 8	54	54	3	3	12
1082	do.....	85.11	12.33	1.85	.88	4.3	35	.50	I	35	S 8	58	58	25	12	14
1084	do.....	79.77	16.88	2.75	.71	434			B	30	S 8	58	58	9	9	24
1086	do.....	84.56	12.61	1.40	.60	653	24	.70	B	45	S 8	58	58	12	12	24
1087	do.....	82.80	13.22	3.00	.98	822	35		I	25	S 8	58	58	9	9	25
1089	do.....	84.73	12.49	2.55	.91	348	35		I	30	S 8	60	54	12	8	25
1091	do.....	83.26	13.50	2.05	.99	625	21	.48	I	30	S 8	57	54	6	16	30
1092	May.....	83.30	13.48	2.32	1.16	756			I	40	M 58	57	54			16
1093	do.....	81.83	13.73	3.10	.90	468	26		I	45	M 58	56	56	12	8	8
1094	do.....	86.09	11.25	3.20	.78	515	26		I	45	M 58	56	56	15	15	18
1095	April.....	83.50	12.59	3.20	.71	496	25		I	30	S 8	58	60	12	12	12
1096	do.....	83.50	12.59	2.28	.93	780			I	35	S 8	61	55	18	18	14
1098	do.....	86.24	10.52	2.27	.97	620			I	35	S 8	61	55	5	5	14
1101	do.....	85.88	11.84	1.52	.76	285			I	40	M 58	56	56	10	10	17
1102	do.....	83.76	13.35	2.08	.81	670	28		I	45	M 58	56	56	8	8	17
1105	do.....	83.76	14.19	3.28	1.08	670	26		I	45	M 58	54	54	6	6	17
1106	do.....	81.45	15.07	3.24	1.10	600			I	240	M 58	58	55	2	2	12
1107	do.....	80.59	14.19	3.24	1.08	600			I	45	M 58	58	55	6	6	17
1109	do.....	85.16	11.75	2.05	1.04	600			E	75	S 8	54	59	12	12	21
1110	do.....	81.62	14.74	2.62	1.02	725	32		E	55	S 8	64	56	4	8	16
1111	May.....	84.90	16.47	2.01	.62	282			G	30	M 59	56	56	5	5	32
1112	do.....	80.90	15.50	4.02	.93	700			G	30	M 59	56	56	5	5	36
1113	do.....	79.89	15.16	4.02	.82	600	35		G	45	M 58	58	54	5	5	32
1114	do.....	83.62	12.69	2.87	.82	700	30		I	45	M 58	58	58	40	40	30
1115	do.....	83.30	13.72	2.27	.71	400	35		G	30	M 60	58	58	5	5	30
1116	do.....	82.78	13.69	2.23	1.30	475	30		G	45	M 58	58	58	12	12	22
1117	June.....	83.08	13.55	2.13	.94	800	26		G	50	M 58	58	58	2	2	10
1118	May.....	82.61	14.03	2.32	1.14	492	30		G	45	M 57	59	59	7	7	30
1119	do.....	81.76	13.75	3.26	1.23	578	33		G	45	M 58	58	58	10	10	28
1121	do.....	82.86	13.24	2.17	.94	384	33		G	45	M 58	54	54	15	15	25
1124	April.....	82.83	13.24	2.67	.44	670	31	.60	B	35	S 8	59	60	32	32	25
1126	May.....	83.55	15.17	1.56	.77	348	30		I	45	M 58	58	58	10	10	26
1127	do.....	83.59	10.66	1.25	.91	700	32	.50	I	30	S 8	61	62	15	15	26
1128	do.....	85.92	12.15	3.25	1.17	460			G	60	S 8	60	56	10	10	30
1129	do.....	83.02	13.43	2.42	1.13	480			G	30	S 8	58	58	15	15	22
1130	April.....	78.29	18.65	1.96	1.4	580	22		E	30	M 58	58	58	22	22	18
1131	May.....	79.85	15.10	3.84	1.21	380	27		E	45	S 8	55	55	7	7	9
1133	do.....	84.47	13.35	1.30	.88	380	20		I	45	S 8	54	56	15	15	22
1136	do.....	82.98	14.55	4.05	.82	475			I	50	S 8	55	56	10	10	18
1137	do.....	82.09	13.94	2.73	.67	540			I	45	S 8	55	56	20	20	18
1138	April.....	86.75	10.55	1.85	.85	596	25		B	75	M 58	58	58	14	14	14
1139	May.....	84.72	13.03	2.75	.82	690	25		B	45	M 58	57	58	18	18	24
1140	do.....	84.72	13.03	1.96	.79	760	25		B	45	M 60	59	59	8	8	28
1141	do.....	83.31	13.29	1.95	.89	756	28		B	45	M 60	58	58	10	10	12
1142	do.....	83.31	13.29	2.61	.79	495	20	.62	I	50	M 60	58	58	11	11	12
1143	June.....	84.02	13.40	1.88	.50	700	35		B	30	M 60	55	55	20	20	25
1145	do.....	84.19	13.47	2.01	.33	500	32		B	25	M 60	58	58	8	8	21
1147	do.....	86.56	13.33	2.59	1.14	120			G	30	S 8	54	54	20	20	16
1154	do.....	82.56	11.64	1.34	.46	667			G	30	S 8	54	54	8	8	16
1155	do.....	83.44	13.05	2.66	.85	435	28		G	25	S 8	58	58	33	33	17
1157	do.....	80.29	15.55	3.30	.86	592			G	45	S 8	58	58	10	10	17
1158	July.....	83.23	14.01	1.70	1.06	820	30		B	50	M 58	56	56	3	3	32
1160	June.....	79.75	16.39	3.19	.79	750			B	22	M 58	58	58	6	6	32
1161	do.....	83.34	13.19	3.68	.79	360	30	.55	B	18	M 58	58	58	3	3	14
1163	April.....	83.12	14.00	1.54	1.33	199	21		B	45	M 58	58	58	5	5	15
1164	May.....	83.25	14.53	1.32	.88	800	33		E	35	S 8	56	56	8	8	14
1165	do.....	82.05	12.95	3.55	.82	225	25		B	40	M 58	56	56	3	3	15
1175	April.....	83.58	12.05	3.15	.82	661	30		G	50	M 58	56	56	6	6	24
1190	July.....	80.26	15.73	3.54	.87	772	26	.50	G	18	M 58	58	58	3	3	9
1193	do.....	81.52	13.00	1.92	1.27	116	30		I	22	M 58	58	58	6	6	32
1195	June.....	84.17	14.48	3.44	1.18	307	25		B	45	M 58	58	58	35	35	24
1198	July.....	82.04	12.93	2.42	.66	690	29		C	45	M 58	58	58	12	12	24
1205	June.....	82.11	13.39	3.10	.47	863	31		C	45	M 58	58	58	5	5	24
1207	do.....	81.08	14.66	3.44	.81	728	30		I	40	M 58	58	58	12	12	18
1208	do.....	82.50	14.89	1.40	.21	392	24		I	40	M 58	58	58	15	15	14
1209	do.....	82.46	14.70	2.54	.30	620	25		B	40	M 58	58	58	3	3	22

TABLE II.—Detailed analyses of samples of Navy butter.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules. ¹	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		<i>Per ct.</i>	<i>Per ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>P. ct.</i>		<i>Mins.</i>		<i>° F.</i>	<i>° F.</i>			
46	July.....	83.31	13.06	2.62	1.01	1,610	35	0.15	G	60	M	48	42		6	16
48	do.....	83.63	12.86	2.46	1.05	936	34	.19	G	60	S	46	42		6	16
49	do.....	83.17	13.09	2.61	1.13	864	34	.19	G	45	M	48	44		7	18
51	do.....	82.90	13.03	2.95	1.12	760	29	.19	G	60	M	48	44		7	16
52	do.....	83.30	12.76	3.01	.93	730	33	.19	G	40	M	50	42		6	15
53	do.....	84.04	12.57	2.64	.75	940	33	.18	G	50	M	50	42		8	16
56	August.....	84.84	11.46	2.87	.83	1,660	29	.14	D	60	S	52	46		12	20
64	do.....	84.73	11.82	2.68	.77	1,687	28	.14	D	40	S	52	46		12	25
65	July.....	83.35	12.63	2.56	1.46	1,333	27	.16	D	50	S	52	46		12	20
80	August.....	84.89	11.32	2.41	1.38	1,846	28	.17	D	75	S	52	46		12	20
128	July.....	83.81	12.83	2.49	.87	1,656	33	.16	G	45	M	50	46		4	16
129	do.....	82.97	13.01	2.88	1.14	756	33	.16	G	50	M	48	42		6	17
131	do.....	84.40	12.12	2.96	.52	1,554	31	.21	G	50	S	48	42		4	16
133	do.....	83.51	11.84	2.84	1.81	1,822	28	.15	D	45	S	51	46		12	25
134	do.....	84.75	11.66	3.11	.48	1,561	27	.19	D	40	S	52	46		12	20
135	do.....	85.18	11.19	2.95	.68	1,785	28	.18	D	40	S	51	46		12	20
136	do.....	84.62	11.97	2.81	.60	1,748	29	.14	D	40	S	51	46		12	20
149	do.....	83.62	12.75	2.95	.68	574		.14	B	30	L	53	49		10	26
150	do.....	83.10	12.92	3.18	.80	660		.14	B	30	L	56	49		10	26
151	do.....	84.33	12.20	2.71	.76	520		.12	B	45	L	52	49		10	25
187	do.....	84.37	12.50	2.38	.75			.15	B	60	L	52	49		10	30
188	do.....	84.41	11.95	2.02	1.62			.15	B	45	L	52	48		10	28
189	do.....	84.36	12.14	2.87	.63			.15	B	45	L	52	48		12	26
190	do.....	83.60	12.31	3.09	1.00	520		.14	B	45	L	52	49		10	28
223	do.....	83.55	12.31	2.91	1.23	525		.14	B	45	L	53	50		10	29
224	August.....	84.06	12.20	3.07	.67	300		.14	B	45	L	52	49		10	26
225	do.....	84.85	11.33	2.70	1.12	450		.13	B	60	L	52	50		12	27
227	do.....	84.96	11.59	2.53	.92	480		.26	B	120	L	50	50		10	28
356	do.....	83.59	12.36	2.91	1.14	406		.31	B	60	S	54	48		10	25
357	do.....	83.79	12.40	2.99	.82	455		.14	I	120	M	51	48		10	14
358	do.....	85.38	11.53	2.33	.76	420		.13	B	45	L	52	48		10	26
359	do.....	85.01	11.53	2.46	1.00	450		.13	B	60	L	50	48		12	33
368	do.....	85.46	11.49	2.14	.91	650		.15	B	120	M	51	48		10	26
1201	July.....	84.16	12.70	2.48	.66	1,278	43	.18	G	50	M	55	51		5	13
Average.		84.13	12.21	2.72	.94	.....	31	.164	.....	55	.....	51	45	.....	9.4	22

¹ The letters in this column stand for small, medium, and large. Granules the size of a grain of wheat and less are called "small"; those as large as a pea or bean are called "medium"; and when larger than a bean they are called "large."

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